UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4

Laboratory Services and Applied Science Division
Quality Assurance and Program Services Branch
980 College Station Road
Athens, Georgia 30605-2720

July 15, 2019

Mr. Anthony Scott Hughes, Chief
Alabama Department of Environmental Management
Field Operations Division
1350 Coliseum Boulevard
Montgomery, AL 36110

LSASD Project ID: 19-0144

Dear Mr. Hughes:

Attached is the final report for 2019 Technical Systems Audit (TSA) conducted on the ambient air monitoring program operated by the Alabama Department of Environmental Management (ADEM). USEPA Region 4 (Laboratory Services and Applied Science Division (LSASD)) conducted the audit on May 6 – 9, 2019 capturing data from January 2016 through December 2018.

I want to thank you for working with my staff while we conducted the audit and afterwards to provide the necessary data to finalize the audit. It is clear based on our interactions that ADEM has a strong monitoring program and continues to make progress in becoming a model program. Additionally, the strength of ADEM 's staff in running a quality monitoring program was evident during the audit. EPA appreciates your efforts in this regard.

Examples of your commitment are: 1) ADEM has made enhancements to its ambient air monitoring program during the last three years; 2) ADEM has made several investments into the air monitoring network and has dedicated significant resources developing or updating/finalizing the Department's quality system documents; 3) ADEM also continues to enhance its' data validation process through with the addition of a new position for quality assurance; 4) ADEM is currently updating the Criteria Pollutant QAPP that documents new policies and procedures established since the previous TSA; 5) ADEM has designed and started the development of a Standards Certification Tracking database to streamline data certification and data review; 6) ADEM has significantly improved its' standards tracking system

As part of our interaction, a draft TSA report was issued to ADEM on June 21, 2019 for review. On July 8, 2019, ADEM provided comments to EPA. In those comments, ADEM expressed agreement with the accuracy of the draft report and requested the identification of the specific pollutants referenced in lack of documentation examples in Finding 4.5.1. The pollutants identification has been addressed. Thank you for your review of the draft report.

While EPA believes that ADEM has a strong monitoring program and associated quality program, I do ask you to focus on the following issues identified in the TSA as you create and implement your corrective action plan: 1) siting concerns regarding unapproved material, site access and security restrictions, 2) documentation (i.e., increasing the detail required to recreate events or shed light on data quality concerns for the field and lab), 3) recordkeeping (i.e., retaining the appropriate documentation to support specific data decisions and data coding in the EPA Air Quality System database, and 4) data management practices and improving the data handling process to minimize vulnerabilities during data verification and validation.

We look forward to working with you to address the issues identified in the TSA report. Please submit a corrective action plan in writing within 30 days. If you have any questions regarding the attached audit report or the response process, please contact Denisse Diaz (706) 355-8554 or Adam Zachary at 706-355-8657.

Sincerely,

John Blevins, Director
Laboratory Services and Applied Science Division

Enclosure (list provided on the back of this page)
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Project ID: 19-0144

2019 Technical Systems Audit Report

Alabama Department of Environmental Management
Montgomery, Alabama

Project Date: May 6 – 9, 2019
Report Date: July 15, 2019

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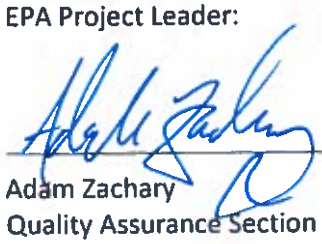

07/15/2019
Date

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Quality Assurance Section
Quality Assurance and Program Services Branch

Approving Official:

7/16/19
Date

Denisse Diaz, Chief
Quality Assurance and Program Services Branch

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1.0 Executive Summary

U.S. Environmental Protection Agency Region 4 Laboratory Services and Applied Science Division (EPA) personnel conducted a Technical Systems Audit (TSA) of the Alabama Department of Environmental Management (ADEM or Department) ambient air monitoring organization in May 2019. The purpose of the TSA was to evaluate the operation and performance of the ADEM air monitoring program, pursuant to *40 CFR Part 58, Appendix A, § 2.5*. Data from the 2016-2018 calendar years were reviewed during the TSA.

ADEM has made numerous enhancements to its ambient air monitoring program in the past three years, some of which stemmed from corrective actions implemented as a result of the 2016 TSA (SESD Project: 16-0474). ADEM staff (i.e., Montgomery office and laboratory) demonstrated technical proficiency when interviewed regarding the instrumentation and analytical methods as well as their roles and responsibilities. There have been recent strides taken to continue to improve and enhance the air monitoring program such as investing in the air monitoring network with new monitoring equipment (i.e., calibrators and analyzers), probe systems, and shelters; there was a marked improvement in standards tracking in 2018. A noteworthy effort has been dedicated to either developing or updating and finalizing the Department's quality system documents, specifically, the data handling procedures for site operators, supervisors, and quality assurance (QA) staff. Further, all certification records requested for standards were located and provided to the EPA. All ADEM laboratory findings and concerns from the 2016 TSA had been addressed prior to the audit and there were no findings or instances of non-conformances with the analytical method requirements or laboratory's quality system during this TSA. The ADEM laboratory and ambient air monitoring staff are handling the lead (Pb) total suspended particulate (TSP) samples as required. The ambient air monitoring staff are evaluating the data generated by the laboratory to ensure it meets all regulatory requirements. Also, ADEM has bolstered the verification process for all field and laboratory information as well as the ability to identify discrepancies by having multiple staff calculate the final TSP Pb concentrations using different information sources (i.e., handwritten and electronic downloaded data).

ADEM currently operates twenty State or Local Air Monitoring Stations (SLAMS). During the TSA, seven of the twenty SLAMS sites were evaluated for compliance to siting criteria pursuant to *40 CFR Part 58, Appendix E*. One out of the seven active air monitoring stations was found to have unapproved fittings in the sampling trains of the gaseous pollutant analyzer which did not meet established regulatory requirements. There were also siting vulnerabilities that should be addressed regarding site access and security restrictions (i.e., Concern 4.1.2) and meeting monitoring objectives due to a potential local source (i.e., Observation 4.1.3).

A few of the Findings in this TSA report will require the application of qualifier codes (i.e., null data and quality assurance) to ambient concentration data reported to the EPA Air Quality System

(AQS) database. Data that does not meet certain critical criteria are considered unusable for regulatory decision-making purposes and require invalidation (i.e., Findings 4.4.2) or an AQS qualifier code (i.e., Findings 4.4.1), which communicates to the end-user its data quality. There were AQS data processing errors shown in Finding 4.4.3 and Concerns 4.4.4 and 4.4.5, which demonstrated a need to ensure AQS meta data and data uploads are accurate.

Overall, the Findings and Concerns of this TSA indicate the need for improvements in ADEM's documentation, recordkeeping, and data management practices. Documentation lacked detail needed to recreate events or shed light on data quality concerns (i.e., see Concern 4.2.3 and Finding 4.5.1). Moreover, documentation was not available to support specific data under review (i.e., audits), or the documentation presented contradicted the data coding in the AQS database (i.e., see Findings 4.2.3, 4.5.1 and 4.5.2). Given that a majority of the quality system documents were recently developed or updated, the documentation and data validation issues indicate a need for more training for the newly implemented data handling procedures and quality assurance processes. ADEM should augment the current data verification and validation processes to fortify against vulnerabilities (e.g., deficiencies in reviewing and justifying AQS qualifier codes).

In general, ADEM staff operate an air monitoring program that is well-maintained and quality-controlled. Data collected within ADEM's air monitoring network is of sufficient quality for regulatory decision-making purposes.

2.0 Introduction

On May 6 - 9, 2019, USEPA Region 4 personnel conducted a TSA of the ADEM ambient air monitoring program. The audit team included Adam Zachary (lead auditor), Keith Harris, Stacie Masters, Michael Crowe, and Richard Guillot from the EPA Region 4 Laboratory Services and Applied Science Division (LSASD). Darren Palmer attended the TSA as a representative from the EPA Region 4 Air and Radiation Division (ARD).

The purpose of the audit was to assess ADEM's compliance with established regulations governing the collection, analysis, validation, and reporting of ambient air quality data. Pursuant to *40 CFR Part 58, Appendix A, § 2.5,* TSAs of each Primary Quality Assurance Organization (PQAO) are required to be conducted every three years. Data reviewed as part of this TSA included that generated during the 2016 – 2018 calendar years. Data was queried from USEPA's AQS database prior to the on-site audit. EPA's Ambient Air Monitoring Technical Systems Audit Form was completed by ADEM staff prior to the on-site audit and is included as Appendix 1 of this report.

The audit included a review of data, recordkeeping, documentation, and support facilities housed at the ADEM Field Operations Division (FOD) Montgomery Field Branch office, located at 1350

Coliseum Boulevard, in Montgomery, Alabama. Seven of the twenty regulatory air monitoring stations operated by ADEM were visited during the audit and the seven stations are listed below.

Common Site Name	**AQS Identification**
Wetumpka	01-051-0004
Chickasaw	01-097-0003
MOMS	01-101-1002
Decatur	01-103-0011
Troy	01-109-0003
Phenix City	01-113-0003
Lhoist	01-117-9001

During the audit, the following ADEM personnel were interviewed.

- Anthony Scott Hughes, Field Operations Division Chief
- Gina Curvin, Air/Facility Section Chief and Ambient Air Quality Monitoring Program Quality Assurance (QA) Coordinator
- Michael Malaier, Air Assessment Unit (AAU) Chief and Ambient Air Quality Monitoring Program Manager
- Vickie Hulcher, Office of Environmental Quality (OEQ) Chief and QA Manager
- Pamela Gross, QA Officer
- Partha Ghosh, AAU AQS Coordinator and Data Processing Technician
- Jerremy Stamps, AAU Auditor
- Stewart Lockwood, OEQ Auditor and QA Officer
- Jerry Redmond, AAU Instrument Technician
- Donna Adams, Montgomery Branch, Site Operator and Network/Site Coordinator
- Tobey Mallory, Montgomery Branch, Site Operator and $PM_{2.5}$ Filter Shipping/Receiving
- Randall, Haire, Montgomery Branch, Site Operator
- David Chasteen, Montgomery Branch, Site Operator and Data Processing Technician
- Nick Cannady, Montgomery Branch, Site Operator and Data Processing Technician
- Al Hickey, Mobile Branch, Site Operator
- Taylor Van Gilder, Mobile Branch, Site Operator
- Josh Wisener, Decatur Branch, Site Operator
- Michael Will, Lhoist North America, Senior Environmental Engineer
- Eddie Malone, AAU Instrument Technician
- James McCormick, AAU Instrument Technician
- Ron Hamilton, Central Laboratory Chief

- Rip Starr, Central Laboratory, Inorganic Section Chief
- Meg Sullivan, OEQ, Laboratory Quality Assurance Officer
- Jocelyn Moore, OEQ, Laboratory Quality Assurance Officer
- Mishka Cole, Central Laboratory, Metals Chemist
- Tiffany Hamit, Sample Receiving Officer

The following AQS reports were reviewed in preparation for this TSA.

- AMP 251: QA Raw Assessment Report (2016 – 2018)
- AMP 256: QA Data Quality Indicator Report (2016 – 2018)
- AMP 350: Raw Data Report (2016 – 2018)
- AMP 380: Site Description Report (2016 – 2018)
- AMP 390: Monitor Description Report (2016 – 2018)
- AMP 430: Data Completeness Report (2016 – 2018)
- AMP 450: Quick Look Criteria Report (2016 – 2018)
- AMP 480: Design Value Report (2018)
- AMP 501: Extract Raw Data (2016 – 2018)
- AMP 503: Extract Sample Blank Data (2016 – 2018)
- AMP 504: Extract QA Data (2016 – 2018)
- AMP 600: Certification Evaluation and Concurrence (2016 – 2018)

Additionally, the following ADEM documents were reviewed.

- *Quality Assurance Project Plan for the Alabama Department of Environmental Management Ambient Air Quality Monitoring Program, Revision 3, January 2019 (Draft).*
- *Quality Assurance Project Plan for the Alabama Department of Environmental Management Ambient Air Quality Monitoring Program, Revision 2, June 2014.*
- *Quality Assurance Project Plan (QAPP) for Ambient Air Monitoring for the Sulfur Dioxide (SO_2) Data Requirements Rule (DRR) in Alabama, January 2017.*
- *Quality Management Plan, Alabama Department of Environmental Management (ADEM), Revision 5, June 2018.*
- *State of Alabama Ambient Air Monitoring Network Plan, 2018.*
- *Addendum to the State of Alabama Ambient Air Monitoring Network Plan, 2018.*
- *ADEM Ozone Monitoring Using Thermo Scientific Monitors, Standard Operating Procedures (SOP) #2530, Revision 3, November 2013.*
- *ADEM Sulfur Dioxide (SO_2) Monitoring Using the TAPI 100, SOP #2480, Revision 0, September 2014.*

- *ADEM Determining Ambient Lead Concentration in TSP Using a Hi-Volume Sampler with Volumetric Flow Control (VFC) and a VFC + Timer/Controller, SOP #2412, Revision 0, November 2013.*
- *Determination of Lead in Ambient Particulate Matter by Flameless Atomic Absorption Spectrophotometry Following Ultrasonic Acid Extraction, EPA Designated Equivalent Method No. EQL-0380-044, SOP #4073, Revision 6.6, August 2018.*
- *Determination of Lead in Ambient Particulate Matter by Flameless Atomic Absorption Spectrophotometry Following Ultrasonic Acid Extraction, EPA Designated Equivalent Method No. EQL-0380-044, SOP #4073, Revision 7.0, April 2019.*
- *Filter Handling for Low Volume $PM_{2.5}$ and PM_{10} Sampling, SOP #2450, Revision 0, March 6, 2019.*
- *$PM_{2.5}$ Sampling with the Partisol Model 2025i Sequential Air Sampler, SOP #2421 Rev. 0, August 11, 2014.*
- *Low Volume $PM_{2.5}$ and PM_{10} Sampling with the Partisol Model 2025i Sequential Air Sampler, SOP #2421, Revision 1.0, February 2019.*
- *Continuous Data Handling Level 1 Review, Ambient Air Operators, SO_2, O_3 & BAM, SOP #2565, Revision 0, July 2018.*
- *Data Handling Level 1 Review, Ambient Air Operators, Manual PM & Hi-Vol Pb Methods, SOP #2569, Revision 0, November 2018.*
- *Level 3, Ambient Air Data Validation, SOP#2566, Revision 0, April 2019 (Draft).*
- *Continuous Data Handling, Level 2 Review, Supervisor Review, SO_2, Ozone, & BAM, SOP #2568, Revision 0, November 2017 (Draft).*
- *Continuous Monitoring of $PM_{2.5}$ Using the Met One BAM 1020, SOP #2440, Revision 0, December 2014 (Draft).*
- *Filter Handling for Low Volume $PM_{2.5}$ and PM_{10} Sampling, SOP #2450, Revision 0, March 2019.*
- *Ozone Monitoring Using Thermo Scientific Analyzers, SOP #2530, Revision 3, November 2013.*
- *$PM_{2.5}$ Sampling with the Partisol-Plus 2025 Sequential Air Sampler, SOP #2420, Revision 2, January 2013.*
- *$PM_{2.5}$ Sampling with the Partisol Model 2025i Sequential Air Sampler, SOP #2421, Revision 0, August 2014.*
- *Standard Operating Procedure for the Determination of Particulate Matter as PM_{10} in the Atmosphere (High-Volume PM_{10} Sampler Method) with Volumetric Flow Control (VFC) and a VFC + timer/controller, SOP #2413, September 2014 (Draft).*
- *Ambient Monitor Site Inspections, EHSO2-6.823, February 2017*
- *Teledyne-API Model T100 Ambient SO_2 Analyzer Preventive Maintenance, EHS02-6.824, February 2017.*

- *Teledyne-API Model T100 Ambient SO_2 Analyzer Multi-point Calibration, EHS02-6.825, February 2017.*
- *Teledyne-API Model T100 Ambient SO_2 Analyzer Manual Zero/Span Precision Check, EHS02-6.826, February 2017.*
- *Verification and Certification of Standards Procedure, EHS02 6.827, February 2017.*
- *Laboratory Sample Handling, SOP # 4902, Revision 3.0, April 2011.*
- *ADEM Laboratory Operations Quality Assurance Manual, 2018.*

3.0 Commendations

The dedication and commitment of the ADEM monitoring staff were evident during the TSA. ADEM has made numerous enhancements to its ambient air monitoring program in the past three years, some of which stemmed from corrective actions implemented as a result of the 2016 TSA (SESD Project: 16-0474). ADEM staff appeared proficient in and knowledgeable of their roles and responsibilities. The staff's commitment to producing quality data and having high data capture was evident during the audit. The Department has made several investments into the air monitoring network with new calibrators and analyzers, and new probe systems that allow for through-the-probe auditing. New shelters have been purchased with plans to install more in the future.

A significant effort has been dedicated to either developing or updating and finalizing the Department's quality system documents. ADEM has completed pertinent SOPs for site operators and quality assurance staff that cover a range of topics, specifically, targeting the enhancement of the data handling processes for the different levels of data review involving site operators, supervisors and quality assurance staff. Multiple data handling SOPs have been developed, which explain Level 1 through 3 data verification and validation processes. ADEM has continued to enhance the data validation process with the addition of a new position for quality assurance. Another noteworthy quality system improvement is that ADEM has developed and implemented standardized data forms for site operators and auditors with conditional formatting imbedded into the forms to signal a deviation from the Department's acceptance criteria. Moreover, ADEM is currently updating the Criteria Pollutant QAPP that documents new policies and procedures established since the previous TSA.

Further, ADEM has designed and started the development of a Standards Certification Tracking database to streamline data certification and data review. The Standards Certification Tracking database will track and house the certificates of all types of equipment, and be searchable by purpose (i.e., QC or QA), instrument type, name, site location and even, by personnel. Lastly, there was a marked improvement in standards tracking in 2018; all certification records for the standards were more easily located and provided to the EPA.

Overall, ADEM has a strong monitoring program and continues to make progress in becoming a model program.

4.0 Findings and Recommendations

The observations from this TSA were compared to USEPA regulations, technical policies and guidance, and the ADEM quality system documentation.

Quality system deviations found through this TSA are classified into three categories: **Findings**, **Concerns**, and **Observations**. These quality system deviations are defined as follows:

Finding:	Nonconformance of high importance which is unacceptable and must be remedied. Includes departures from or absences of specified requirements (e.g., regulatory, QMP, QAPP, SOP, etc) or a guidance deviation which could significantly impact data quality.
Concern:	Nonconformance of somewhat lesser importance as compared to a finding, but one that should be remedied. Includes departures from widely accepted best science / management practices, as well as practices which could have potential detrimental effect on the ambient air monitoring program's operational effectiveness, quality system, or sampling/measurement results.
Observation:	An infrequent deviation, error, or omission which does not impact the output of the quality of the work product, but may impact the record for future reference.

For each of these categories, corrective action recommendations are provided. Corrective actions are required for all quality system deviations ranked as **Findings** or **Concerns**. Depending on the severity of the deviation, a specific data deliverable(s) may be requested to show that the corrective action recommendation has been successfully implemented. In these cases, the TSA report will specify the deliverable(s) that will be required for AQS and/or submitted to EPA. **Observations** do not require corrective actions.

4.1 FIELD OPERATIONS

4.1.1 **Finding:** Unapproved fittings were observed in the sampling train of a gaseous pollutant analyzer.

Discussion: The Lhoist (01-117-9001) air monitoring site did not meet siting requirements stated in *40 CFR Part 58, Appendix E*. Studies have been conducted to determine the suitability of materials for use in ambient air monitoring sampling trains. Pursuant to *40 CFR Part 58, Appendix E, § 9(a),* for those analyzers which measure reactive gases only inert materials – borosilicate glass, Teflon, or their equivalent – are allowed in the sampling train (from the inlet probe to the back of the analyzer). During the inspection of ADEM's monitoring stations, EPA auditors observed Kynar fittings in the sample train of the

analyzer at Lhoist SO_2 DRR air monitoring station (01-117-9001). These materials do not meet Appendix E specifications.

Recommendation: For the Lhoist site utilizing Kynar components, the unapproved material must be immediately replaced with Teflon (or its approved equivalent). Furthermore, inspection of sample train components should be included as part of the annual siting evaluations. Please provide evidence, in the form of a picture, as proof the Kynar fitting has been replaced.

4.1.2 **Concern:** Access to the Chickasaw air monitoring site is not adequately restricted.

Discussion: There is a lack of security at the Chickasaw air monitoring site. The security fence is not properly used to restrict access to the shelter and the air monitoring equipment. Site entry was easily attained due to an unlocked and opened gate. Additionally, the $PM_{2.5}$ sampler was not fully secured/locked. The cabinet (body) of the $PM_{2.5}$ sampler – housing the motors, flow controllers, timers, and sampler logbooks – was not locked or secured in any manner. Access to the sampler cabinets could allow a vandal to alter or completely stop the sample collection process; moreover, a vandal could damage/remove the sample filter through the cabinet body by dismantling the motor/flow controller assembly. Further, the door key for the air monitoring shelter is stored in the sampler cabinet, thus, allowing access to the air monitoring instrumentation (i.e., SO_2 and O_3 analyzers) housed within. Lastly, access to the roof is gained via an extension ladder, which is left in position at the rear of the shelter; the ladder is not permanently attached, nor is there a rung cover to prevent unwarranted roof access. These vulnerabilities should be addressed to ensure data integrity.

Recommendation: EPA recommends that additional security measures be implemented at the Chickasaw air monitoring site to restrict site access. At a minimum, the sampler cabinets should be locked. Please provide EPA with a plan to improve security practices for the Chickasaw air monitoring station.

4.1.3 **Observation:** There is a bus maintenance facility currently under construction adjacent to the Phenix City air monitoring station that could impact ambient concentrations per *40 CFR Part 58, Appendix E, § 3*.

Discussion: *40 CFR Part 58, Appendix E, § 3(a)* states:

> *Local minor sources of a primary pollutant, such as SO_2, lead, or particles, can cause high concentrations of that particular pollutant at a monitoring site… If a monitoring site is to be used to determine air quality over a much larger area, such*

as a neighborhood or city, a monitoring agency should avoid placing a monitor probe, path, or inlet near local, minor sources. The plume from the local minor sources should not be allowed to inappropriately impact the air quality data collected at a site.

40 CFR Part 58, Appendix E, § 3(b) continues *"Similarly, local sources of nitric oxide (NO) and ozone-reactive hydrocarbons can have a scavenging effect causing unrepresentatively low concentrations of O_3 in the vicinity of probes and monitoring paths for O_3."*

The Phenix City air monitoring station was relocated to the South Girard School (01-113-0003) in 2017, and it was a consolidation of all ambient air monitoring activities (i.e., PM and O_3) in the Phenix City area, previously in downtown and Ladonia. $PM_{2.5}$ and ozone monitoring began on January 18, 2017, and on March 1, 2018, respectively. Recently, the county installed a maintenance facility for school buses near the air monitoring station. As stated above, the maintenance facility has potential to modify the site's monitoring objective (i.e., urban scale), impact data (i.e., $PM_{2.5}$ and O_3), and violate *Appendix E, Section 3(a)* siting criteria by functioning as a local minor source, thus contributing to high pollutant concentrations due to the proximity of gasoline and diesel pumps for vehicles.

Further, the area immediately around the air monitoring site is covered in grass. The construction of the maintenance facility also included a retention pond area adjacent to the monitoring site. This area remains bare soil and has a potential effect on $PM_{2.5}$.

Recommendation: ADEM acknowledged the maintenance facility as a concern and the Department has investigated relocating the Phenix City air monitoring station. At the time of the TSA, the facility was not operational, but ADEM should monitor the $PM_{2.5}$ concentrations when this maintenance facility begins operation. The BAM 1022 could possibly be used for this purpose. The site operator should note the condition of the retention pond area over time to help document possible sample concentration impacts. Please consult with ARD about these siting vulnerabilities.

4.1.4 **Observation:** Vegetation growth at the Troy (01-109-0003) air monitoring station was close to exceeding the minimum *40 CFR Part 58, Appendix E* requirements.

Discussion: Encroaching trees can provide surfaces for SO_2, NO_2, and ozone adsorptions or reactions, as well as surfaces for particle deposition. Because of vegetation's ability to scrub pollutants, *40 CFR Part 58, Appendix E, § 5* requires that 90% of a probe's monitoring path be at least 10 meters or more from the drip-line of trees. At the Troy (01-109-0003) air monitoring station, the tree dripline distances adjacent to the samplers

marginally met the minimum EPA specifications (approximately 10 meters); however, the various tree measurements with respect to height, distance and degrees of clearance are right at the regulatory limits. The trees in question appear to be mature and fully grown, but with continual growth over the year, these could potentially violate the regulatory requirement.

Recommendation: A more frequent review of the Troy air monitoring site may be warranted to ensure these limits are not exceeded.

4.2 LABORATORY OPERATIONS

ADEM utilizes Inter-Mountain Laboratories (IML) in Sheridan, Wyoming, for its $PM_{2.5}$ and PM_{10} filter weighing activities (i.e., gravimetric analyses). Therefore, this TSA did not cover $PM_{2.5}$ and PM_{10} weighing laboratory operations. However, ADEM is responsible for all $PM_{2.5}$ and PM_{10} filter shipping and receiving activities, as well as the final validation of the resulting data. Currently, there is a designated staff member within each of ADEM's FOD Branch Offices (i.e., Montgomery, Decatur, Mobile, and Birmingham) charged with carrying out filter shipping/receiving activities. Due to time limitations, EPA auditors could not audit these sample handling operations within each FOD Branch Office. However, EPA auditors did review the PM filter shipping and receiving activities performed within the Montgomery Branch. EPA auditors interviewed the ADEM staff regarding these activities and observed the sample handling techniques with the chain of custody procedures. The shipping and receiving activities in the Montgomery Branch appeared to be in good order.

ADEM performs in-house analysis of Pb total suspended particulate (TSP) samples, as well as further analysis of the Pb samples utilizing Flameless Atomic Absorption. Laboratory procedures performed by ADEM were evaluated against the requirements in EQL-0380-044 to ensure compliance with the Federal Equivalent Method for the determination of lead in Total Suspended Particulate Matter (TSP).

4.2.1 **Concern:** The laboratory provides a split sample to the ambient air monitoring site operator for further analyses by an independent laboratory. The Chain of Custody form reviewed for this process was not reflective of the custody of the sample.

Discussion: The laboratory provides a split sample to the ambient air monitoring site operator to be analyzed by an independent laboratory for additional quality control. The original sample filter is cut to provide ADEM a representative sample for extraction and analysis. The remaining filter material is further cut in half and placed into a separate envelope for shipping. Once this sample is generated, a new Chain of Custody form is initiated. The form presented during the audit indicated that the sample originated with the field site operator and not the laboratory analyst who created the split sample. Additional signature lines were noted on the Chain of Custody form to be pre-populated with the field operator's identification. The form did not properly capture the true custody of the sample.

Recommendation: ADEM should develop an additional Chain of Custody form that properly documents this activity or modify the current procedures for documenting the Chain of Custody form to clarify the handling of the split samples. Please provide EPA with a revised COC form or procedure for filling out the form as a deliverable to address this concern.

4.2.2 **Concern:** Laboratory staff and Ambient Air Monitoring Staff are not evaluating the independent audit strip filters with the same acceptance criteria that is established in Appendix D of the *Quality Assurance Handbook Volume II, March 2017*.

Discussion: Independent audit strips are prepared and analyzed with each batch of sample filters. The purpose of these audits is to provide an independent assessment of the entire analytical process. High Volume Lead (TSP) data validation templates are provided in Appendix D of the *Quality Assurance Handbook Volume II*. The templates list the analysis audits as an Operational Evaluation with an acceptance criterion of <10.1% difference from the target value for the sample analyzed across each quarter. Laboratory staff indicated audit criteria being used by laboratory data reviewers was 20%, monitoring staff indicated that they evaluate the audits at 15%. Corrective action for audits outside of either acceptance criteria were not documented.

Recommendation: ADEM staff should develop a consistent acceptance criteria and corrective action for the audit strips results and these actions should be included in both the laboratory and field data handling procedures. Further, given that ADEM utilizes audit strips prepared and supplied by EPA annually at a known concentration, control charting of the audit strip data to identify trends associated with the preparation and analysis of the strips over the course of each year would be a valuable data assessment tool to implement moving forward. Please provide EPA with a revised data handling procedure to address this concern.

4.2.3 **Concern:** During the review of the data handling procedures employed by the ambient air monitoring staff in relation to TSP lead, there was a lack of documentation provided when lead samples were invalidated.

Discussion: Field Data Sheets accompany all samples to the field and document filter identification, scheduled sample dates, sampler information and field observations. As such, these forms serve as records for all samples. During the audit, the data sheets for sampling events were not available for review for samples invalidated by the field operator. These forms serve as records for all samples and should be managed as such for all valid and invalid samples.

Recommendation: All records should be available for review for all scheduled samples. Additionally, records should be retained as required by Department records retention policies. Please provide to EPA a plan to address the record retention practices.

4.2.4 **Observation:** Laboratory data is not backed up on the local area network (LAN) in accordance with a specific schedule.

Discussion: ADEM laboratory staff indicated during the audit that laboratory instrument data is not backed up on the LAN routinely. Data from the analytical equipment is backed

up by analysts on individual jump drives only. Additionally, there was no set frequency for the data back-ups to occur.

Recommendation: In order to preserve instrument data, ADEM should investigate potential options for backing up laboratory equipment on a designated frequency.

4.2.5 **Observation:** ADEM Laboratory could benefit from increased efficiency with alternative TSP lead analysis method.

Discussion: The current preparation and analytical refence method in use is an approved reference method for preparation and analysis of TSP lead samples; however, there are approved methods available which utilize more modern techniques and instrumentation that could potentially reduce analyst time. The current Federal Reference Method, codified in *40 CFR Part 50, Appendix G,* was updated to include the use of ICP-MS technology. ADEM can adopt a different reference or equivalent method for use in support of the ambient air monitoring program, provided the Department follows both the preparation and analytical procedures of the newly-adopted method. A list of the approved reference and equivalent methods can be located at the following link:

https://www.epa.gov/sites/production/files/2018-12/documents/amtic_list_dec_2018_update_1.pdf

Recommendation: EPA encourages ADEM to consider other FEMs that may benefit the laboratory and increase efficiency.

4.3 RECORDS MANAGEMENT

4.3.1 **Observation:** NIST-traceability certification records for 2016 and 2017 criteria pollutant standards were difficult to locate during the TSA.

Discussion: Certification records requested during on-site audit activities, specifically from 2016 and 2017, were difficult to locate. Multiple copies of the same certification were observed, each with a different naming convention. Certifications were also located within different folders on the Department's shared network drive. The Department acknowledged this weakness and stated that the filing system observed in 2016 and 2017 was a continuation of the previous TSA report concern (Concern 4.3.2, SESD Project: 16-0474). EPA noted marked improvement of 2018, when a consistent file naming convention was implemented, and a dedicated network drive folder was created to store records.

Pursuant to *40 CFR Part 58, Appendix A, § 2.6*, gaseous and flow rate standards must be NIST-traceable; in order to demonstrate traceability, certification/calibration records must be maintained. EPA notes that, in order to maintain NIST-traceability, EPA protocol gas standards, photometers, and flow measuring instruments must be recertified at the prescribed frequencies defined in the Department's QAPP, typically every 365 days. To ensure an expired standard is not used to verify or calibrate an ambient monitor, a system should be in place to guarantee that standards used are within certification.

Recommendation: ADEM should continue to develop a system to track certification dates, which is monitored by QA staff, to ensure expired standards are not used in the network. Given the size of the network, and the number of standards in use, an electronic inventory system would be beneficial. An electronic inventory system would not only help manage standard certificates but would also help track standard certification dates to ensure standards are recertified at the proper frequency. An electronic inventory system would also grant data validators access to critical standards information necessary to validate the collected data for its intended use. The system could also be used to track movement of standards and the maintenance history of equipment.

EPA is aware that a database is currently being developed for this purpose.

4.4 DATA MANAGEMENT

4.4.1 **Finding:** Ambient concentration data was reported to AQS as valid when the sulfur dioxide analyzer was not meeting specifications required by the Federal Equivalent Method (FEM).

Discussion: The QA Raw Assessment Report (AMP 251) summarizes the QA/QC data reported by the Department. In reviewing the AMP 251 in preparation for this TSA, EPA auditors observed a June 6, 2017 annual performance evaluation for the SO_2 analyzer at the Lhoist (01-117-9001) air monitoring site yielded poor results for the low-level audit concentration (i.e., 72.4% difference in first audit level, 0.0003-0.0029 ppm). Additional records were requested to examine the corrective action process implemented for the low-level audit concentration failure. It was determined a corrective action was not performed (i.e., Concern 4.5.4). Records indicated that the analyzer was exceeding criteria set forth in the instrument manual, potentially deviating from the FEM designation. The *ADEM-Field Operations SO_2 Data Form* showed the instrument's sample flow (i.e., 742 ccm) and slope (i.e., 1.4610); the parameters were not within the instrument manual's specifications required by the FEM during the audit.

Additional Lhoist records reviewed revealed that ambient concentration data was reported to AQS when the SO_2 analyzer was not meeting specifications required by the FEM. Pursuant to *40 CFR Part 58. Appendix C, § 2.1,* "Except as otherwise provided in this appendix, a criteria pollutant monitoring method used for making NAAQS decisions at a SLAMS site must be a reference or equivalent method as defined in §50.1 of this chapter." In order for an analyzer to be considered a FRM or FEM, the instrument must be operated in accordance with its *40 CFR Part 53* designation specifications. The FEM for the Teledyne API T100 SO_2 analyzer states that the instrument is to be "operated with the appropriate instrument manual." The instrument manual—*Teledyne API Model T100, UV Fluorescence SO_2 Analyzer, Operation Manual, Number 06807, Revision F, August 2016*—for the SO_2 analyzer states that to operate as an FEM, the sample flow must be between 650 ccm ± 10% (i.e., 585 – 715 ccm) and the slope must be 1.0 ± 0.3 (i.e., 0.97 – 1.3). Moreover, the instrument manual states that the slope should be verified following calibration procedures in order to ensure linearity, which is an indicator of data quality. For a majority of the recorded quality control checks during the 2017 monitoring season at Lhoist, these parameters did not meet its FEM designation (e. g., analyzer ranges for sample flow and slope were 724 – 744 ccm and 1.4610 – 1.6770, respectively). The December 14, 2017 *ADEM-Field Operations SO_2 Data Form* indicated the SO_2 analyzer ultimately was back in control and met its FEM designation following an adjusted calibration.

Recommendation: For the data collected in the ADEM network at the Lhoist air monitoring site, EPA recommends that the SO_2 analyzer be thoroughly evaluated to

determine the root causes of the slope and sample flow rate issues. After this investigation, the impact to data quality should be determined by QA staff. At a minimum, data should be flagged to indicate the analyzer was not operating in accordance with the instrument manual's specifications; however, given the magnitude of the sample flow and slope exceedances, data may need to be invalidated. EPA requests to be notified of the results of this evaluation and provided copies of documentation that detail the results of performance testing, maintenance, and/or repair.

Federal Reference Method (FRM)/FEM requirements must be considered when collecting and validating regulatory data. This requirement must be clearly addressed in the Department's QAPP and specified in related SOPs. The Level 1 and Level 3 Data Handling and Validation SOPs (i.e., SOP #2565 and #2566) should be updated to include a discussion of data verification processes, including a review of all instrument diagnostic parameters to indicate compliance with its FEM designation. Because temperature is part of the equivalency method, the *Ambient Air Monitoring Program: Audit Procedures* (SOP #2567) should be finalized with language requiring all auditors to monitor, review and document shelter temperature along with instrument diagnostics during annual performance evaluations to ensure instruments are meeting the FRM/FEM requirements. Please provide these SOPs to EPA for review.

EPA also recommends the inclusion of compliance with analyzer diagnostics on the *Site Visit Checklist, Revision 1, January 2017*. EPA recommends that associated calibration and 1-point quality control forms be updated to include both the slope and flow rate specifications, with conditional formatting that alerts field technicians of exceedances, when appropriate.

4.4.2 **Finding:** Regulatory $PM_{2.5}$ data that was reported failed a critical criteria flow check.

Discussion: A monthly flow rate verification result (4.3% d) was reported to AQS that exceeded the acceptance criteria (4% d) established in *40 CFR Part 50, Appendix L, § 9.2.5*. The check occurred on May 1, 2018, on the collocated sampler (POC 2) located at the Phenix City site (01-113-0003). The previous passing check occurred on April 9, 2018.

Logbooks reviewed during on-site investigations show that the site operator identified the failed check and determined that samples collected since the last passing check on April 9, 2018, were to be voided. However, the operator failed to fill out a "Monthly Missing Data and Site Comments" form; therefore, data validators did not know that the data were to be invalidated.

Recommendation: All data impacted by the failed flow rate verification are to be invalidated. Please provide EPA with an AMP 350 as evidence that the samples have been invalidated.

4.4.3 **Finding:** Continuous Federal Equivalent Method (FEM) $PM_{2.5}$ data are not being reported in accordance to *40 CFR Part 58.20(b)* and *58.16(a).*

Discussion: ADEM currently operates an FEM continuous monitor (i.e., Met One BAM 1022) at the Phenix City (01-113-0003) air monitoring site. The Met One BAM 1022 is designated as a special purpose monitor (SPM) (i.e., not used in design value calculations for the NAAQS), and it is being operated as a new method for a 2-year evaluation period. The monitor is configured with a very sharp cut cyclone and meets the requirements of the FEM designation EQPM-1013-209. These data are suitable for regulatory decision-making purposes. However, the data were reported to AQS parameter code 88502, a non-regulatory $PM_{2.5}$ parameter.

40 CFR Part 58.20(b) states "Data collected at an SPM using a FRM, FEM, or ARM meeting the requirements of appendix A must be submitted to AQS according to the requirements of §58.16." The BAM 1022 data meets these requirements and therefore must be reported to AQS parameter code 88101, a regulatory $PM_{2.5}$ parameter.

Recommendation: All historical and future data collected using a $PM_{2.5}$ FEM must be moved from AQS parameter 88502 to 88101. In accordance with 40 CFR 58.11(e), ADEM should work with USEPA Region 4 Air and Radiation Division personnel to apply a National Ambient Air Quality Standard (NAAQS) exclusion flag to these data while ADEM is evaluating this new method. The NAAQS exclusion may apply for up to two years from the date of deployment. Please provide EPA with evidence in the form of an AMP 350 Report once these data are reported to the proper parameter code.

4.4.4 **Concern:** Performance evaluation results were entered into the incorrect audit level entry field in the AQS database.

Discussion: EPA published a revision to *40 CFR Part 58* in March 2016. The requirements by which annual performance evaluations are to be performed were revised. The previous version used a five audit-level structure (a series of five concentration ranges from which test atmosphere concentrations were selected) and required that an instrument be challenged at three consecutive audit levels. The regulations promulgated in March 2016 expanded the number of audit levels to ten and changed the rules dictating which levels were to be selected, per *40 CFR Part 58, Appendix A, § 3.1.2.1*.

A review of the results from sulfur dioxide annual performance evaluations submitted to AQS (i.e., AMP 504: Extract QA Data and AMP 251: QA Raw assessment) showed that the low-level requirement for SO_2 was being met in 2017 - 2018; however, the Department was not entering the audit concentration results into the correct AQS audit level field. ADEM uses the Teledyne API Model T100 Analyzer, which has a Federal Reference and Equivalent Method (FRM/FEM) code designation of EQSA-0495-100 (i.e., AQS reference method code of 100). According to the meta data in AQS, the minimum detection limit (MDL) for method code "100", the method utilized by the Department, is 0.4 ppb. Three times the MDL is 1.2 ppb, which falls into the first audit level, 0.0003-0.0029 ppm, according to *40 CFR Part 58, Appendix A, § 3.1.2.1* and the May 2016 OAQPS *Technical Note- Guidance on Identifying Annual PE Audit Levels Using Method Detection Limits and the 99th Percentile*. Although ADEM performed audits for the correct audit level in 2017 - 2018, the assessment and monitor concentrations for the low audit level were inserted incorrectly into AQS audit fields (i.e., AQS audit field for concentrations in level 3 was utilized with all concentrations corresponding to audit level 1).

Recommendation: Please correct the low audit level assessment and monitor concentrations in AQS and provide EPA an AQS AMP 251 report showing that this correction was made, once completed.

4.4.5 **Concern:** Ambient concentrations are reported to AQS with the incorrect method code.

Discussion: Each federal reference method (FRM) or federal equivalent method (FEM) instrument is assigned a method code to be used when reporting data to EPA's AQS database. As new models of each instrument are developed by the manufacturer, the method code may or may not change. Teledyne API T100 SO_2 analyzers are exclusively used in the ADEM air monitoring network and correspond to an AQS method code of 100. However, the current method code reported to AQS is 600, and it corresponds to the Teledyne API 100 EU, which is a trace-level instrument.

Recommendation: The method code information in AQS should be updated to reflect the current instrumentation in use. The installation date of these new analyzers should also be determined and input into AQS as well. Please submit an AQS AMP390 Report (i.e., Monitor Description Report) when this information has been updated.

Further, EPA encourages review of AQS site and monitor metadata on a routine basis. AQS metadata for a particular air monitoring station may be reviewed following an individual annual site evaluation or reviewed for the entire air monitoring network each year (e.g., during the annual network plan development). Such reviews are important to ensure that metadata related to those sites and monitors, which are reconfigured or relocated, are updated appropriately in AQS.

4.5 QUALITY ASSURANCE

4.5.1 **Finding:** Documentation needs improvement due to insufficient detail to document QA/QC events to support data validity decisions.

Discussion: Documentation needs improvement due to insufficient detail to document events and data decisions. Several records were reviewed while visiting air monitoring stations and performing in-office TSA activities. The air monitoring station and instrument logbooks for 2016 – 2018 were reviewed at the main office. Prose-style comments by staff sometimes lacked detail needed to recreate events or shed light on data quality concerns. Additionally, no signatures or dates were observed that would indicate the data was verified and validated. All ADEM logbooks and QA/QC forms should contain more detail to sufficiently narrate the events and clearly indicate the decision-making process regarding data coding, data reduction, and data handling. During the data review process, staff were asked about either an assigned AQS QA qualifier code for data that did not meet regulatory requirements or data that was invalidated (e.g., see Finding 4.5.2). The following is a brief list of the requests, where there was a lack of documentation for the application of AQS qualifier codes:

- March 9, 2017, at Fairhope (01-003-0010), where the AMP 350 report showed ozone ambient concentrations replaced with BL null data qualifier codes.
- August 17 – 18, 2017, at Fairhope (01-003-0010), where the AMP 350 report showed ozone ambient concentration invalidated as AS null data qualifier codes (i.e., poor quality assurance) in the midst of valid automated nightly QC checks, but poor logbook documentation about the applied AS.
- September 20, 2017, at Ward Sumter (01-119-0003), where the AMP 350 report showed a blank space for ozone ambient concentration however, the QA staff did not respond with a null data qualifier code.

There were instances observed where audits were conducted but the field records were not retained. All documentation for audits, whether valid or invalid, must be kept per Section A-9.3, *Data Archival and Retrieval* and Table A-9-1, *Reporting Records and Documents* of the Department's QAPP. EPA auditors reviewed AQS AMP 251 and AMP 350 reports for the 2016 – 2018 dataset. The annual performance evaluations (APEs) indicated on both reports were reconciled and discrepancies were observed between the reports. The main disagreement was reported null data qualifier codes on the AMP 350 (i.e., BL, QC audit) and no reported date or results for the APE on the AMP 251 report.

For example on March 9, 2017, at Fairhope (01-003-0010), the AMP 350 report showed ozone ambient concentrations replaced with BL null data qualifier codes (i.e., QA audit). EPA auditors requested the audit records, but all associated documents to recreate the event were not produced (i.e., audit form); the ADEM auditor did not retain the audit form due to unacceptable results. The other documentation for the audit provided contrasting information. Although the monthly missing data form (MMDF) indicated the missing hours of ambient data were due to an audit, the electronic strip chart revealed it was not a valid audit. A discussion with the ADEM auditor revealed that the missing ambient data and applied AQS null data qualifier codes were due to the testing of audit equipment; the equipment testing was not recorded on a data form nor in the Fairhope site/instrument logbooks. Section A-9.2.1, *Logbooks* of the Department's QAPP states that "All individuals who enter the building will make a dated entry in the logbook detailing the reason for the visit and the activities performed." The site logbook only indicated that the auditor was present at the site but does not signal an audit nor equipment testing. Ambient data was coded incorrectly in AQS due to a lack of detail in documentation (i.e., no description of the equipment testing, no retained audit form and the mislabeled MMDF).

There was a lack of documentation for the SO_2 data in January 2018 at the Ward Sumter (01-119-0003) air monitoring site. The AQS "3" QA qualifier code (i.e., Field Issue) was applied for several days (i.e., January 4, 12-13, 16-17, 29-30). The records documenting the data-decision to use the qualifier code were requested for review, but the information was not produced during the TSA. This revealed a potential vulnerability in the data validation process, specifically for reviewing AQS QA qualifier codes.

There was another occurrence of either poor or no documentation for an AQS QA qualifier code at the Lhoist (01-117-9001) air monitoring site. At Lhoist on April 3, 2018, AQS "V" QA qualifier codes (i.e., Validated Value) were applied to SO_2 ambient air concentrations (1300 - 1700). Documentation was requested to recreate this event. The records to confirm the data decisions did not exist. These instances were discussed with the data validation team and the vulnerability was identified regarding AQS QA qualifier codes. The Level 3 data validation team did not review any applied AQS QA qualifier codes at that time, due to a deficiency in the data validation process in part in how AirVision generates the requested data. Staff explained that AirVision only reports the invalidation null codes when generating monthly reports and in order to review all applied null data and QA qualifier codes, a box should be selected to see all qualifier codes. Selecting the option to display AQS QA qualifier codes on the monthly report was not used during the scope of the TSA audit. AQS qualifier codes (i.e., quality assurance or null data) should be reviewed and the associated documentation referenced to ensure the codes were applied appropriately.

A last example of insufficient documentation was illustrated in the SO_2 analyzer logbook at the Chickasaw air monitoring site where no entries were observed over the span of a year. The July 21, 2016 logbook entry indicated a new pump installation due to a sample flow warning. One year passed before the next logbook entry on August 22, 2017.

Recommendation: Data forms must be filled completely and retained according the Department records retention policy, and prose-style comments augmented to contain more specific details, specifically regarding issues that impact data validity. When documents are reviewed during data verification and validation, each reviewer should sign and date the reviewed document or package, indicating that the review was complete. Please provide EPA with a plan to improve documentation practices.

4.5.2 **Finding:** Criteria pollutant data entered into the EPA AQS database have not been completely validated.

Discussion: The data validation process needs additional development. Data validation determines whether data generated is of suitable quality for its intended use; which, for the SLAMS network, is that of NAAQS regulatory decision-making purposes. Towards that end, data validation involves comparing data to the numerous measurement quality objectives (MQOs) identified in the Department's QAPP, as well as to the various records and documentation that support those data. During the TSA, auditors identified multiple criteria against which air monitoring data quality did not appear to be routinely judged (e.g., see Finding 4.4.1). The following list summarizes those parameters that did not appear to be fully or consistently incorporated into the Department's data validation process. *Please note: This list does not encompass all parameters that should be reviewed during the data validation process*.

- No review of instrument diagnostic information to determine data validity (e.g., see Finding 4.4.1).
- Not evaluating the results from collocated $PM_{2.5}$ data pairs from individual sampling events to look for anomalies at the site level.
- No review of $PM_{2.5}$ collocation data against the data quality objective, per *40 CFR Part 58, Appendix A, § 2.31.1* and Table A-7-1, *Measurement Quality Objectives* of ADEM's QAPP.
- No validation that $PM_{2.5}$ samples are retrieved within the allowable sample pick-up time, per *40 CFR Part 50, Appendix L, § 10.10* and Table A-7-1, *Measurement Quality Objectives* of ADEM's QAPP.
- Not using the same acceptance criteria for Pb audit strip filters (e.g., Concern 4.2.2).
- Not reviewing all operator documentation for justification of AQS null data qualifier codes assigned to ambient air data (e.g., see Finding 4.4.2).

- Not reviewing the documentation (i.e., MMDF) for all applied AQS qualifier codes (e.g., see Finding 4.5.1).
- Not reviewing all AQS qualifier codes (i.e., quality assurance) and the associated documentation referenced to ensure the codes were applied appropriately (e.g., see Finding 4.5.1).
- Not consistently reviewing ambient data in conjunction with results from external audits, specifically, low level audit results including the National Performance Audit Program (NPAP) and Performance Evaluation Program (PEP).

EPA auditors reviewed the 2016 – 2018 dataset compared to the Department's QAPP and regulatory requirements and found instances where data decisions could not be completely explained and/or there was a lack of documentation to recreate the use of certain AQS null data and QA qualifier codes (see Findings 4.4.1 and 4.5.1).

For example, no review of AQS null data qualifier codes occurred at Chickasaw (01-097-0003) air monitoring site for a September 5, 2017 ozone audit. Data coded within AQS indicated that the site experienced temperature exceedances (i.e., AE, shelter temperature outside of limits) two hours preceding the audit. Level 3 data validation documentation for the AE null data qualifier code applied to the ozone data could not be found, and a review of the temperature minute data and electronic strip chart indicated the shelter temperature did not exceed the acceptance criterion for the ozone monitor (i.e., Teledyne API 400 Series Ozone Analyzer, 5-40°C). However, the site records indicated the beta attenuated monitor (BAM) at the site experienced an exceedance of its established temperature criterion, and as a result, the site operator applied the temperature rate of change criterion not only to the BAM, but to all instruments in the air monitoring station.

Recommendation: Data validation must include a review of the MQOs identified in the Department's QAPP, along with associated documentation and records. EPA acknowledges that significant efforts have been directed towards strengthening ADEM data validation processes. The findings and concerns identified in this TSA report should be used to identify additional opportunities to strengthen ADEM's data validation process.

The Department should augment its data validation process to incorporate the review of the items listed above for all criteria pollutant data sets, in addition to the other measurement quality objectives stated in the QAPP. EPA acknowledges that the Department has recently developed several data handling SOPs (i.e., SOP #2565, #2566, #2568, and #2569). The findings and concerns identified in this TSA report should be used as a guide to augment and finalize the content of the documents. All staff involved in data

review should subsequently be trained on the formalized procedures, including operators. Please submit the revised SOPs to EPA for review.

4.5.3 **Finding:** ADEM air monitoring quality system documents need to be revised and further developed. This Finding was discussed in the 2016 ADEM TSA Report (see Finding 4.5.2, SESD Project: 16-0474)**.**

Discussion: Pursuant to *40 CFR Part 58, Appendix A, § 2.1.2*: "The QAPP must be suitably documented in accordance with EPA requirements (reference 3 of this appendix) and **include standard operating procedures** for all EDOs either within the document or by appropriate reference" [emphasis added]. The EPA document *Requirements for Quality Assurance Project Plans (EPA QA/R-5)* and the EPA document, *Guidance for Quality Assurance Project Plans (EPA QA/G-5)*, both state that SOPs are part of the QAPP. In the QAPP Requirements R-5 document, specifically, it states: "Current versions of all referenced documents must be attached to the QAPP itself or be placed on file with the appropriate EPA office and available for routine referencing." Therefore, QAPPs must have current SOPs.

Further, EPA Region 4 grant commitments require SOPs to be reviewed on an annual basis and revised whenever procedures change. The grant commitments further require the development of new SOPs within six months of instrument start-up. A majority of the quality system documents reviewed during this TSA were either outdated and did not accurately reflect the work being conducted by the Department within the scope of the TSA (i.e., SOPs related to continuous gaseous monitors referencing Thermo Scientific equipment) or were just finalized in 2019 (i.e., all data handling SOPs). SOPs for newer instrumentation (i.e., the Teledyne API T400 ozone analyzers) had not been completed and were in draft form, although work on these documents was in progress (e.g., see Section 2.0 of this report).

Recommendation: Existing SOPs need to be updated and new SOPs developed and finalized to represent the current procedures employed by ADEM, as well as address the areas where improvement is needed (identified within the body of this TSA report). These documents need to be submitted to EPA for review, once completed. In the interim, EPA requests ADEM develop an updated schedule for SOP development and revisions, detailing the order of priority, and projecting submission dates to EPA.

4.5.4 **Concern:** Formal corrective action process has not been implemented.

Discussion: In accordance with Section B-2.5, *Sampling/Measurement System Corrective Action* of ADEM's QAPP, "Corrective action measures in the Ambient Air Quality

Monitoring Network will be taken to ensure the data quality objectives are attained." Section C-1.1.4, *Follow-up and Corrective Action Requirements*, requires notification of the AAU chief when deficiencies are uncovered. However, this process is not consistently implemented. For example, a review of the Wetumpka site logbook illustrated the need for a structured corrective action process. During the site logbook review, it was noted by the site operator on September 12, 2018 of multiple issues (i.e., Teledyne T750U had erratic output, poor visibility in the shelter and water entering building), which were not normal, but no documentation that the issues were addressed or resolved.

Recommendation: EPA recommends a corrective action report (CAR) policy which is initiated by the person who discovers a problem, documents troubleshooting, contact with management and technical experts, and any data management decisions. CARs should be reviewed by a manager or Quality Assurance Officer to ensure corrective actions taken were appropriate and successful. Moreover, the Department should augment its corrective action process by establishing time frames for when issues are to be reported and completed, as well as define the chain-of-command for reporting corrective actions. Lastly, in order to terminate or close the report, it should be signed by an approval authority. This strategy should be included in the Department's QAPP so all staff are aware of the process. Please provide EPA with a plan to improve the corrective action practices.

4.5.5 Observation: Quality control data is not control-charted.

Discussion: Although not required, control charts are excellent tools for identifying both short- and long-term trends and shifts in data. ADEM does not prepare control charts of laboratory or field data. Laboratory and field blanks are types of QC samples which can be tracked to assess trends over time, such as contamination. ADEM collects QC data that could be tracked for trends – such as the results of nightly QC checks for the gaseous analyzers, collocated pairs, and the results of flow rate verifications on particulate matter samplers. Control charts of analyzer zero checks, for example, will visually illustrate and identify a slow drift in analyzer response which may not be clear when simply reviewing zeros daily. In this regard, the use of control charts could prompt the recalibration of an analyzer prior to data failing acceptance criteria. Control charts of diagnostics data (e.g., see Finding 4.4.1) from gaseous analyzers can also identify faltering equipment, which could prompt proactive maintenance, repair, or replacement, prior to instrument malfunction. In this manner, control charts can prevent data loss, thereby increasing overall data quality and data completeness.

Recommendation: EPA encourages ADEM to control-chart the QC data collected within its ambient monitoring program.

5.0 Conclusions

ADEM has made numerous enhancements to its ambient air monitoring program in the past three years. ADEM staff (i.e., Montgomery office and laboratory) demonstrated technical proficiency when interviewed regarding the instrumentation and analytical methods as well as their roles and responsibilities. There have been noticeable steps taken to continue to improve and enhance the air monitoring program (e.g., new monitoring equipment and shelters, Standards Certification Tracking database and updated sampling configuration for gaseous instruments). The ADEM laboratory and ambient air monitoring staff are handling the TSP lead samples as required. The ambient air monitoring staff are evaluating the data generated by the laboratory to ensure the data meets all regulatory requirements. Final concentration values are calculated by multiple staff utilizing different sources of information to verify all field and laboratory information and identify discrepancies between documented values and electronic data downloaded from the samplers.

During this TSA, the findings and concerns identified a need for improvements in recordkeeping, documentation and data validation process. There is a need for more training in the newly developed quality system documents focused on quality assurance (i.e., data handling SOPs). The AQS data processing errors shown in Finding 4.4.3 and Concerns 4.4.4 and 4.4.5 demonstrate a need to ensure AQS meta data and data uploads are accurate. Findings 4.4.1 and 4.4.2 in this TSA report will require the application of quality assurance qualifier codes to ambient concentration data reported to the AQS database. Please notify EPA when all corrections have been made. Further, any modification to data in AQS after it has been originally certified, pursuant to *40 CFR Part 58.15,* requires recertification of the data.

ADEM must develop a corrective action plan and timeline to address the findings and concerns identified in Section 4 of this report and respond back to EPA within 30 days of receipt of the final TSA report. Please note that the corrective actions do not have to be completed by this date, only a plan to address the findings and concerns. Observations do not require a corrective action, therefore, do not need to be addressed. If ADEM anticipates that the development of the corrective action plan will not be completed within 30 days after the receipt of the final TSA report, please contact EPA to request an extension.

Appendix 1

ADEM Response-Technical Systems Audit Form

APPENDIX A

United States

Environmental Protection Agency

Region 4

Science & Ecosystem Support Division

980 College Station Road

Athens, Georgia 30605

Ambient Air Monitoring

Technical Systems Audit Form

Contents

1. General

Note: As you answer the questions throughout this questionnaire, please keep in mind that answers to some questions may be documented in your agency's QMP, QAPP(s), SOP(s), and/or annual monitoring network plan. As an alternative to providing language in the comment field for such questions, please consider listing an appropriate reference to the document(s) – including document name and section number – in which the relevant information has been documented. Such references should help reduce the burden of completing this questionnaire through mitigating redundancy.

ADEM – Alabama Department of Environmental Management

Address:

1350 Coliseum Blvd.

Montgomery, AL 36110

Date(s) of Technical Systems Audit: 5/6/2019

This section of the questionnaire completed by: Gina Curvin and Mike Malaier

Key Individuals (e.g., Agency Director, Ambient Air Monitoring Network Manager, QA Manager, Technical Support/Instrument Repair Manager, etc.):

Title/Position	Name
Agency Director	Lance R. LeFleur
Air Program Administrator	Ron Gore
Ambient Air Monitoring Program Manager	Michael Malaier
Quality Assurance Manager	Vickie Hulcher
Field Operations Division Chief	Scott Hughes
Air Monitoring Program QA Coordinator	Gina Curvin
Central Laboratory Branch Chief	Ron Hamilton

Program Organization

a.1 Organizational Chart

File attached

a.2 Key Position Staffing

Enter the number of personnel available to each of the following program areas, and any vacancies, if applicable.

Program Area	Number of People (Primary)	Number of People (Backup)	Number of Vacancies
Network Management (site setup, siting, ANP, etc.)	3	2	0
Field Operations (QC checks, site visits, site maintenance, etc.)	10	3	1
Quality Management (audits, QA documentation, certifications, etc.)	5	2	0
Data and Data Management (data review, validation and acquisition system, AQS, etc.)	7	1	0
Technical Support (equipment repair and maintenance)	2	0	1
Internal Analytical Laboratory (if applicable) ($PM_{2.5}$ gravimetric, high-volume PM_{10}/Pb, toxics, etc.)	2	1	0

Comment on the need for additional personnel, if applicable.

Click or tap here to enter text.

b. Facilities

*Identify the principal facilities where the agency conducts work related to air monitoring. **Do not include monitoring stations**, but do include facilities where work is performed by contractors or other organizations.*

Ambient Air Monitoring Function	Facility Location	Comment on any significant changes to be implemented within the next one to two years.
Instrument repair	AAU Lab Montgomery, AL	Click or tap here to enter text.
Certification of Standards (e.g., gases, flow transfers, MFCs)	AAU Lab Montgomery, AL or Manufacturer	Click or tap here to enter text.
PM filter weighing	IML Lab Sheridan, WY	Click or tap here to enter text.
Pb analysis	ADEM Central Lab Montgomery, AL	Click or tap here to enter text.
Data verification and processing	Montgomery, AL Decatur, AL Birmingham, AL Mobile, AL	Click or tap here to enter text.
General office space	Montgomery, AL Decatur, AL Birmingham, AL Mobile, AL	Mobile Office will be moving to a new location
General lab/work space	Montgomery, AL Decatur, AL Birmingham, AL Mobile, AL	Click or tap here to enter text.
Storage space (short and long term)	Montgomery, AL Decatur, AL Birmingham, AL Mobile, AL	Click or tap here to enter text.
Air Toxics (Carbonyls, VOCs, PAHs, Metals)	NA	Click or tap here to enter text.

Indicate below any facilities that should be upgraded or any needs for additional physical space (laboratory, office, storage, monitoring stations, etc.).

Because of concerns with shelter temperature stability and age of existing shelters, we continue to upgrade our O3 shelters as resources allow.

c. General Documentation Policies

Complete the following table. If relevant information is provided in a QMP, QAPP, and/or SOP, please provide an appropriate reference in the comment field in place of descriptive language.

Question	Yes	No	Comment
Does the agency have a documented records' management plan?	☒	☐	Click or tap here to enter text.
• If yes, does this include electronic records?	☒	☐	AirVision and QC Forms
Does the agency have a list of files considered official records and their media type (i.e., paper and/or electronic)?	☒	☐	Click or tap here to enter text.
Does the agency have a schedule for retention and disposition of records? Are records kept for at least three years? Comment on how long records are retained.	☒	☐	Yes, paper records are kept for a min 6 yrs. QAPP, Section A-9
Who is responsible for the storage and retrieval of records? If more than one person, please indicate those personnel responsible for storing/retrieving records, including what records each is responsible for.			Retrieval of all records-AAQM Program Manager & AAQM QC Coordinator; Storage of Electronic Forms-All monitoring staff
What security measures are utilized to protect records?			Security is built into Air Vision system and regularly backed up, paper strip charts are kept in locked area of lab building, AQS is official data record, electronic records on intranet backed up by IT, electronic files cannot be deleted from LAN
Where/when does the agency rely on electronic files as primary records?			Data polled by Air Vision and transmitted to AQS. Electronic forms used in field laptops, data downloaded to laptops
What is the system for storage, retrieval and backup of these files?			All files securely stored on the LAN with very limited access and routinely backed up, AirVision on an IT server which is routinely backed up .

d. Training

d.1 Training Plan

Complete the following table.

Question	Yes	No	Comment
Does the agency have a training plan? If yes, where is it documented?	☒	☐	QAPP Section A-8
If yes, does the training plan include:			
• Training requirements by position?	☒	☐	More like training required for each area, i.e. QA, validation, etc.
• Frequency of training?	☒	☐	QAPP lists frequency of recurrent workshops
• Training for contract personnel?	☐	☒	Click or tap here to enter text.
• A list of core QA-related courses? Please attach a list of required courses or cite where such information may be found.	☒	☐	QAPP Table A-12
• Does it make use of seminars, courses, EPA-sponsored college level courses, etc.?	☒	☐	When available
Are personnel cross-trained for other ambient air monitoring duties?	☒	☐	Every field office operator is a backup for other operators and those in the Mgy Office also act as data processing technicians, auditors, and site coordinators
Are training funds specifically designated in the annual budget?	☒	☐	Funds are designated in annual air budget or SESARM budget for training and workshops

d.2 Training Events

Indicate below the most recent training events, and identify the personnel who participated in them.

Event	Date(s)	Participant(s)
National Air Quality Conference	8/1/2018	Curvin, Ghosh, Malaier
Region 4 Monitoring Workshop	4/1/2018	Lockwood, Gross, Haire, Curvin, Malaier
Region 4 Ambient QA Training Workshop	10/1/2017	Gross, Curvin
API Advanced Repair Training	11/1/2018	Jones

e. Oversight of Contractors and Supplies

e.1 Contractors

Complete the following table. If your agency does not use contract personnel, proceed to section e.2 Supplies.

Contractors	Yes	No	Comment
Who is responsible for oversight of contract personnel?			**AAQM Program Manager**
Are contractors providing a service (e.g., independent performance audits, $PM_{2.5}$ lab) audited? How often?	☒	☐	**Audits are conducted approx. every 3 yrs.**
What steps are taken to ensure contract personnel meet training and experience criteria?			**NA**
Are contractor Quality Documents reviewed before procuring a service?	☒	☐	**Laboratory QAPP must be included with bid packet**
How often are contracts reviewed and/or renewed?			**Every 3 years**

e.2 Supplies

Complete the following table. If relevant information is provided in a QMP, QAPP, and/or SOP, please provide an appropriate reference in the comment field in place of descriptive language.

Suppliers	Yes	No	Comment
Have specifications been established for consumable supplies and/or equipment?	☒	☐	Click or tap here to enter text.
What supplies and equipment have established specifications?			All of the FEM and FRM monitoring equipment and supporting equipment like calibrators and flow verification reference devices. Replacement parts have to meet manufacturer specifications.
Is equipment from suppliers open for bid?	☒	☐	As a state agency all of our purchases must be bid unless a manufacturer can be registered as the sole source of the product.

2. Quality Management

This section of the questionnaire completed by: Gina Curvin and Mike Malaier

Key Individual(s):

Title/Position	Name
AAQM Program QA Coordinator	Gina Curvin
QA Officer	Pam Gross
AAQM Program Manager	Mike Malaier
Quality Assurance Manager	Vickie Hulcher

a. Status of QA Program

a.1 QA and QC Activities

Complete the following table.

Question	Yes	No	Comment
Does the agency perform *all* quality assurance (QA) activities with internal personnel (i.e., developing QMPs/QAPPs/SOPs and DQOs/MQOs, performing systems audits, assessments and performance evaluations, corrective actions, validating data, QA reporting, etc.)? If not, please indicate in the comment field who is responsible and which QA activities are performed.	☐	☒	DQOs/MQOs are developed by EPA and adopted by ADEM; NPAP and NPEP audits are conducted by external contractors; All other activities are conducted by ADEM personnel.
If the agency has contracts or similar agreements in place with either another agency or contractor to perform audits or calibrations, please name the organization and briefly describe the type of agreement.			NA
Does the agency perform *all* quality control (QC) activities with internal personnel (i.e., zero/span/one-point QC checks, calibrations, flowrate, temperature, pressure and humidity checks, certifying/recertifying standards, lab and field blanks, data collection, balance checks, leak checks, etc.)? If not, please indicate in the comment field who is responsible and which QC activities are performed.	☐	☒	Level 2 Calibrator re-certifications are done by EPA staff; Flow reference devices roots meter are re-certified by the manufacturer; All other QC activities are conducted by ADEM personnel

a.2 QC Acceptance Criteria

Complete the following tables.

Question	Yes/No	Location	Comment
Has the agency established and documented criteria to define agency-acceptable QC results?	Yes	QAPPs	All limits are published in the QAPP Tables A-6 through A-11

Pollutant	Does the agency adhere to the critical QC acceptance criteria for criteria pollutants[1] and meteorological measurements[2]?	QC Acceptance Criteria (if other than validation templates)	Action or Warning Limits	Corrective Action
O3	Yes	NA	5.1%	Follow SOP#2565 Figure 39; Exceeding the warning limit prompts investigation but does not invalidate data. QAPP Table A-6
SO2	Yes	NA	7.1%	Follow same rules as O3 but with acceptance criteria and warning limit levels for SO2. QAPP Table A-7
PM10	Yes	NA	NA	Typically data is either voided or flagged to last passing QC activity; QAPP Table A-10 SOP#2421 & 2569
PM2.5	Yes	NA	NA	Typically data is either voided or flagged to last

[1] Appendix D Validation Templates of the *QA Handbook for Air Pollution Measurement Systems Volume II*

[2] Appendix C Validation Templates of the *QA Handbook for Air Pollution Measurement Systems Volume IV*

				passing QC activity; QAPP Table A-8 SOP#2421 & 2569
Continuous PM2.5	Yes	NA	NA	Typically data is either voided or flagged to last passing QC activity; QAPP Table A-9
Pb	Yes	NA	NA	Typically data is either voided or flagged to last passing QC activity; QAPP Table A-11

b. Internal PE Audits

b.1 Internal Audit Questions

Complete the following table.

Question	Yes	No	Response
Does the agency maintain a laboratory to support QA activities?	☒	☐	**AAU Lab**
Has the agency documented and implemented specific audit SOPs separate from monitoring SOPs?	☐	☒	**A separate audit SOP is planned**
Are the QA personnel organizationally independent from the personnel responsible for generating environmental data (40 CFR Part 58, Appendix A, § 2.2)? If no, please explain in the comment field.	☒	☐	**Those performing QA activities are either organizationally independent (OEQ) or are not directly responsible for the data collection of that pollutant.**
Are annual performance evaluation (PE) audits conducted by technician(s) other than the routine site operator(s) (40 CFR Part 58, Appendix A, § 3.1.2)? If no, please explain in the comment field.	☒	☐	**We have two designated auditors who are not operators.**
Does the agency have identifiable auditing equipment and standards (specifically intended for sole use) for audits?	☒	☐	**The auditors maintain their own set of equipment which is not used in normal operations.**
Are audit equipment and standards ever used to support routine calibration and QC checks required for monitoring network operations? If yes, please explain in the comment field.	☐	☒	Click or tap here to enter text.

b.2 Internal Audit Procedures

If the agency includes performance audit procedures in pollutant-specific monitoring SOPs, please provide an appropriate reference for each pollutant. Otherwise, if the agency does not have a performance audit SOP, please describe the performance audit procedure for each type of pollutant.

Pollutant	SOP/Performance Audit Procedure
O3	SOP 2530 sec. 11.9
SO2	SOP 2480 sec. 11.5
Other PM2.5	2421 sec. 12

b.3 Certification of Audit Standards

Attach a list or use the table below to provide information on the certification(s) of audit standards (e.g., flowmeters, gas standards, etc.) currently being used.

Vendor	Audit Standard	Certification	Certification Frequency	Date of Last Certification
MESA DryCal Defender low	Piston volume meter	External	Annually	7/17/18
MESA DryCal Defender high	Piston volume meter	External	Annually	7/17/18
TELEDYNE Hastings	MFC	External	Annually	5/24/18
TELEDYNE Hastings	MFC	External	Annually	5/24/18
MULTICAL S-150104	FLOW AAU	External	Annually	2/4/2019
MULTICAL S-150104	TEMP AAU	External	Annually	2/4/2019
MULTICAL S-150104	BP AAU	External	Annually	2/4/2019
MULTICAL S-190201	FLOW OEQ	External	Annually	2/20/19
MULTICAL S-190201	TEMP OEQ	External	Annually	2/20/19
MULTICAL S-190201	BP OEQ	External	Annually	2/20/19
PRAXAIR	SO2 19.6 / N2	External	2 years	7/12/2017
PRAXAIR	SO2 5.04 / N2	External	2 years	1/2//2016
PRAXAIR	SO2 5.48 N2	External	2 years	12/31/2018
TELEDYNE T750U	SO2 AAU	Internal	Semi-annually	2/28/2019
TELEDYNE T750U 74-19365	SO2 OEQ	Internal	Semi-annually	2/28/2019
TELEDYNE T750U 74-19365	OZONE OEQ	Internal	Annually	
THERMO 49C	OZONE AAU	Internal	Annually	2/14/2019
Grasby	PM LEAD OEQ	Internal	Annually	
TELEDYNE ZAS	ZERO AIR AAU	Internal	Annually	1/17/2019
TELEDYNE ZAS SN146	ZERO AIR OEQ	Internal	Annually	1/17/2019

Complete the following table.

Question	Yes	No	Comment
Does the agency have a separate certified source of zero air for performance audits?	☒	☐	A cylinder is maintained in the AAU Lab
Does the agency have procedures for auditing and/or validating performance of meteorological monitoring?	☐	☐	NA

b.4 Audit Equipment

Use the table provided below to list the agency's audit equipment and age of audit equipment (e.g., flow standards, calibrators, zero air systems, etc.).

Manufacturer	Make and Model Number	Purchase Year or Year Acquired
CHINOOK	MULTICAL AAU	2015
CHINOOK	MULTICAL OEQ	2019
TELEDYNE	T750U AAU	2016
TELEDYNE	T750U OEQ	2016
THERMO	49C AAU	1999
TELEDYNE	ZAS AAU	2016
TELEDYNE	ZAS OEQ	2016
Grasby	HiVol orifice	Choose an item.

b.5 Audit Acceptance Criteria

Complete the following tables.

Question	Yes/No	Location	Comment
Has the agency established and documented criteria to define agency acceptable audit results? If yes, comment where (page number, section, etc.)	Yes	QAPPs	Table A-6 through A-11

Pollutant	Does the agency adhere to the audit acceptance criteria for criteria pollutants[3] and meteorological measurements[4]?	PE Audit Acceptance Criteria (if other than validation templates)	Do the audit levels (gaseous PE audits only) meet 40 CFR Part 58, Appendix A, § 3.1.2.1 criteria?	Corrective Action
O3	Yes	NA	Yes	Refer to AAQM PM for corrective actions
SO2	Yes	NA	Yes	Refer to AAQM PM for corrective actions
PM2.5	Yes	NA	N/A	Refer to AAQM PM for corrective actions
PM10	Yes	NA	N/A	Refer to AAQM PM for corrective actions
Continuous PM2.5	Yes	NA	N/A	Refer to AAQM PM for corrective actions
Pb	Yes	NA	N/A	Refer to AAQM PM for corrective actions

[3] Appendix D Validation Templates of the *QA Handbook for Air Pollution Measurement Systems Volume II*

[4] Appendix C Validation Templates of the *QA Handbook for Air Pollution Measurement Systems Volume IV*

c. Planning Documents Including QMP, QAPP, & SOP

c.1 QMP Questions

Complete the following table.

Question	Response
Does the agency have an EPA-approved quality management plan (QMP)?	Yes
• If yes, what is the approval date of the QMP?	6/27/2018
• If yes, has the QMP been approved by EPA within the last 5 years?	Yes
• If yes, is the QMP multi-media or air-specific?	Multi-media
• If yes, are changes to the plan needed that have not yet been approved by EPA?	No

c.2 QAPP Questions

Complete the following table.

Question	Response
Does the agency have an EPA-approved QA project plan (QAPP)?	Yes
• If no, has the agency been delegated self-approval?	Choose an item.
How often does the air monitoring agency review QAPPs? Are these reviews documented? If so, please provide a location.	Previously, reviews were conducted at least every 5 yrs and as needed; changes were tracked in Appendix F; Once new QAPP is approved it will be reviewed annually.
Does the agency have any QAPP revisions still pending EPA approval?	Yes
How does the agency verify that the QAPP is fully implemented?	Through Audits and Data Validation Activities
How are staff notified and trained when a QAPP is revised?	Notification of all new documents/forms is done through monthly email from OEQ; Changes are discussed in the annual workshop and conference calls and through emails.
What personnel regularly receive updates?	All ADEM staff are notified of updates.
Does the agency have any missing QAPPs that need to be developed?	No
• If yes, list any missing QAPPs.	Need to adopt national speciation QAPP

Provide a list of all QAPPs as an attachment or use the table below. If provided elsewhere, please provide a reference.

QAPP Title	Approval Date	Pollutant(s)	Status
Quality Assurance Project Plan For Ambient Air Monitoring For the Sulfur Dioxide (SO2) Data Requirements Rule (DRR) In Alabama R 0.1	2/6/2017	SO2	Approved
Quality Assurance Program Plan For The Alabama Department Of Environmental Management Ambient Air Quality Monitoring Program R 2.0	7/29/2014	O3, SO2, PM2.5, PM10, Pb, ContPM2.5	Approved
Quality Assurance Program Plan For The Alabama Department Of Environmental Management Ambient Air Quality Monitoring Program R 3.0	NA	O3, SO2, PM2.5, PM10, Pb, ContPM2.5	In Review
Quality Assurance Project Plan Chemical Speciation of PM2.5 Filter Samples	1/27/2014	PM2.5	Approved

c.3 SOP Questions

Complete the following tables.

Question	Response
Are all standard operating procedures (SOPs) complete, or are some in development?	Some in development
Does the agency have any missing SOPs that need to be developed?	Yes
• If yes, list the SOPs that need to be developed.	AAQMP Data Validation AAQMP Audit Procedures Data Handling for Supervisors AAQMP Reference Device Traceability AAQMP iTSA Procedure
Are SOPs available to all field operations personnel?	Yes
Are SOPs for "episodic monitoring" prepared and available to field personnel? Refer to *QA Handbook Volume II, Section 6.0*.	No
Are SOPs based on the framework contained in *Guidance for Preparing Standard Operating Procedures (SOPs) (EPA QA/G-6)*?	Yes
Does the agency have SOPs specific to data handling and validation?	Yes
Who approves SOPs?	AAQM Program Manager Division Chief Quality Assurance Manager
How often are SOPs reviewed? Are these reviews documented? If so, please provide a location. How often are SOPs updated?	Annually; Tracked changes table in the back of every SOP; SOPs are updated annually or as needed if critical error.
How are staff notified and trained when a SOP is revised?	Notification of all new documents/forms is done through monthly email from OEQ

Provide a list of all SOPs as an attachment or use the table below. If provided elsewhere, please provide a reference.

SOP Title	Approval Date	Pollutant(s)	Status
Preparation, Review, Approval, Distribution, and Archival of Standard Operating Procedures (SOP) Documents	4/30/2018	All	Approved
Preparation, Review, Approval, Distribution, and Archival of Quality Assurance Program/Project Plans (QAPPs)	4/30/2018	All	Approved
Data Handling for Operators – Ozone, SO2 and BAM	7/28/2018	O3 SO2 Cont PM2.5	Approved
Data Handling for Operators – PM & Pb	11/20/2018	PM Pb	Approved

Data Handling for Supervisors	Click or tap to enter a date.	Data Management	In Development
AAQMP Data Validation	Click or tap to enter a date.	Data Management	In Development
AAQMP Audit Procedures	Click or tap to enter a date.	All	Not Created
AAQMP Reference Device Traceability	Click or tap to enter a date.	All	Not Created
AAQMP Annual Maintenance and Repair Procedures	Click or tap to enter a date.	All	In Development
AAQMP Node and AQS Database Management	8/15/2016	Data Management	Approved
AAQMP iTSA Procedures	Click or tap to enter a date.	Network Management	Not Created
Determining Ambient Lead Concentration in TSP Using a High Volume Sampler with Volumetric Flow Control (VFC) and a VFC+ Timer/controller	11/4/2013	Pb	In Review
Det of Lead in Ambient Particulate Matter by Flameless Atomic Absorption Spectrophotometry	8/9/2018	Pb	Approved
Standard Operating Procedures for Sulfur Dioxide Using API-Teledyne T-100	6/9/2014	SO2	In Review
Standard Operating Procedures for Ozone Using Thermo Scientific 49C and 49i	11/18/2013	O3	Approved
Standard Operating Procedures for Ozone Using API T400	Click or tap to enter a date.	O3	In Development
Low Volume PM2.5 and PM10 sampling with the Partisol model 2025i Sequential Air Sampler	2/14/2019	PM2.5 PM10	Approved
AAQMP PM Filter Handling SOP	3/6/2019	PM2.5 PM10	Approved
Standard Operating Procedures for PM2.5 using BAM 1022	Click or tap to enter a date.	PM2.5	In Development
Standard Operating Procedures for PM2.5 using BAM 1020	Click or tap to enter a date.	PM2.5	In Development

d. Corrective Action

Complete the following table.

Question	Response
Does the agency have an operational, documented, and comprehensive corrective action program in place?	No
• As a part of the QAPP?	Yes
• As a separate document, or part of a SOP?	No
Does the agency have established and documented corrective action limits for QA and QC activities?	Yes
Are corrective action procedures based on results of the following that have exceeded established limits?	Yes
• 1-Point QC checks	Yes
• Calibrations and zero/span checks	Yes
• Flow rate verifications	Yes
• PEs (gaseous audits and semi-annual flow rate audits)	Yes
• Precision goals (collocated $PM_{2.5}$ and PM_{10})	No
• Bias goals	No
• NPAP audits	No
• PEP audits	No
• Completeness goals	Yes
• Data audits	Yes
• Technical Systems Audits	Yes
How is responsibility for implementing corrective actions assigned?	As assigned by the AAQM Program Manager
How does the agency follow up on implemented corrective actions?	Fo
Briefly describe <u>at least two</u> recent examples of the ways in which the above corrective action system was employed to remove problems.	
1. Operator notified PM of high BAM conc.; PM compared value to nearby monitor and they were very different. PM then reviewed smoke trace and discovered that smoke from a fire was passing over the monitor during the high values and did not pass over the nearby monitor. High Conc confimed.	
2. Operator reviews O3 data and has unusual values. Operators notes these hours as “ZZ” and provides as much detail about the circumstances. During validation, the ZZ Team is assembled to review all available information and code the data appropriately. Data decision is documented and form added to LAN.	

e. Quality Improvement

Complete the following table.

Question	Response
Have all deficiencies indicated in the previous TSA report been corrected? If no, please list and explain.	No, still working on updating documents, finalizing new validation system and a certificates database to track certification of devices and equipment.
What actions were taken to improve the quality system since the last TSA?	Please see the ADEM 2016 TSA Corrective Action Plan
Since the last TSA, do your control charts and/or AQS reports indicate that the overall data quality for each pollutant is steady or improving?	Not sure, implementation of data validation added more review and revealed additional issues. The next TSA cycle should show improvement to data quality.
What was/were the cause(s) when goals for measurement uncertainty per 40 CFR Part 58, Appendix A were not met (if applicable)?	NA
What are your agency's plans for quality improvement?	Continue implementation and improvement of data validation system and improve documentation.

f. External Performance Audits

Complete the following table.

Question	Response	Comment
Does your agency participate in the following external performance audits? If not, please explain why.		Click or tap here to enter text.
• NPAP	Yes	Click or tap here to enter text.
• $PM_{2.5}$-PEP	Yes	Click or tap here to enter text.
• Pb-PEP	Yes	Click or tap here to enter text.
• Pb Strip Audit	Yes	Click or tap here to enter text.
• Ambient Air Protocol Gas Verification Program (AA_PGVP)	N/A	Gas Vendor participates. Have not been asked by EPA to provide cylinder.
• Round Robin metal PT	N/A	Click or tap here to enter text.
• NATTS/PAMS PT	N/A	Click or tap here to enter text.
List other performance audit participation.		NA
Who performs NPAP and PEP audits?		EPA Contractor

3. Network Management

This section of the questionnaire completed by: Gina Curvin and Mike Malaier

Key Individual(s):

Title/Position	Name
Mike Malaier	Program Manager
Gina Curvin	QA Coordinator
Donna Adams	Network/Site Coordinator

a. Network Design

*For monitoring organizations and agencies that **do not submit the annual network plan (ANP)** required by 40 CFR 58.10, please complete the table below. For those monitoring organizations that **do submit an ANP**, proceed to section b. Siting.*

Site Name	AQS Site ID #	Pollutant(s) Monitored	Proposed Changes
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

b. Siting

b.1 Site Evaluations

Complete the following table.

Question	Yes	No	Comment
How often are site evaluations for 40 CFR Part 58, Appendix E criteria conducted?	Frequency:		**Annually**
	Date of last review:		**2019**
	Where is this documented?		**Appendix of annual network plan**
Are there any siting issues?	☒	☐	**See b2 below**
Does the current level of monitoring effort (station placement, instrumentation, etc.) meet requirements imposed by current grant conditions?	☒	☐	Click or tap here to enter text.

b.2 Site Non-Conformance

Please list any monitors with siting non-conformances, the AQS Site ID numbers for those monitors, the type of non-conformance and the reason(s) for the non-conformance. If none of your agency's monitors have siting non-conformances, proceed to section c. Waivers.

Monitor	AQS Site ID #	Type of Non-Conformance	Reason(s) for Non-Conformance
PM2.5	01-097-0003	Spacing from Trees	Small shrubby trees that were cut down in 2018 have grown back and need to be removed.

c. Waivers

c.1 Waiver Questions

Complete the following table.

Question	Yes	No	Comment
Does your agency have any waivers?	☐	☒	Click or tap here to enter text.
Does your agency plan to request any waivers?	☐	☒	Click or tap here to enter text.
Has your agency obtained necessary waiver provisions to operate equipment which does not meet the effective reference and equivalency requirements (if applicable)?			**NA**
Do any sites vary from the required operating schedules in 40 CFR 58.12?	☒	☐	**Some collocated sites operate more frequently than required**
Does the number of collocated monitoring stations meet the requirements of 40 CFR Part 58, Appendix A? If no, which pollutant(s)?	☒	☐	Click or tap here to enter text.

c.2 Waiver Types

Indicate any waivers requested or granted by the EPA Regional Office, and provide waiver documentation. If your agency does not have any waivers, proceed to section d. Documentation.

Waiver Type	Reason
Choose an item.	Click or tap here to enter text.

d. Documentation

Complete the following table.

Question	Yes	No	Comment
Are hard copy or electronic site information files retained by the agency for all air monitoring stations within the network? If so, please provide the location of these files in the comment field.	☒	☐	**ESC Folder on LAN**
Does each station have the required information, including:			
• AQS Site ID Number?	☒	☐	Click or tap here to enter text.
• Photographs of the four cardinal compass points?	☒	☐	Click or tap here to enter text.
• Startup and shutdown (if applicable) dates?	☒	☐	Click or tap here to enter text.
• Documentation of instrumentation?	☒	☐	Click or tap here to enter text.
Who has custody of the current network documents?	**Name:** Click or tap here to enter text. **Title:**Click or tap here to enter text.		**Unsure of response, the file is available on the web for public to view; Only PM can modify it.**

4. Field Operations

This section of the questionnaire completed by: Gina Curvin and Mike Malaier

Key Individual(s) (e.g., Field Manager, Field Supervisor, Field QA Manager, etc.):

Title/Position	Name
Mike Malaier	Program Manager
Gina Curvin	QA Coordinator
Samantha Connole Shawn LaGrone Carla Snow	Regional Section and Unit Chiefs

a. Field Support

Complete the following table.

Question	Yes	No	Comment
On average, how often are most of your stations visited by a field operator?			Weekly or Bi-Weekly
Is this visit frequency consistent for all reporting organizations within your agency (if applicable)?			YES
On average, how many stations does a single operator have responsibility for?			2
How many of the stations of your SLAMS/NCORE network are equipped with sampling manifolds?			None. Single line systems are used with integrity check or sample/calibration line systems.
Do the sample inlets and manifolds meet the requirements for through-the-probe audits?	☒	☐	In 2019 ADEM is replacing single line systems with sample/calibration systems.
• Briefly describe the most common manifold type and flow rate.			NA
• How often are manifolds cleaned?			NA
• What is used to perform the cleaning?			NA
• Are manifolds equipped with a blower?			NA
• Is there sufficient air flow through the manifold at all times?			NA
• How is the air flow through the manifold monitored?			NA
• Is there a conditioning period for the manifold cleaning?			NA
• What is the residence time?			Sample line residence time is determined at the site setup.
• How often is the residence time calculated?			See above
Sampling lines: 1) What material is used for instrument sampling lines?			Teflon

2) How often are sampling lines changed or cleaned?			Never Cleaned; Replaced Annually or upon repeatedly exceeding integrity warning limit.
Do you utilize uninterruptable power supplies or backup power sources at your sites?	☒	☐	Click or tap here to enter text.
What instruments or devices are protected?			Datalogger, Analyzer, Calibrator, Strip Chart Recorder, Ethernet switch

*__***Please attach an example of recent documentation of sample residence time calculation.***__

b. Instrument Acceptance

b.1 Instrumentation

Please list the instruments in your inventory.

Pollutant	Number of Instruments	Make and Models	Reference or Equivalent Number
O3	12	TAPI T-400	EQOA-0992-087
O3	8	Thermo Scientific 49C/49I	EQOA-0880-047
SO2	4	TAPI T-100	EQSA-0495-100
PM10	2	Thermo Scientific 2025i	RFPS-1298-127
Pb	2	Click or tap here to enter text.	40CFR50, appendix B EQL-0380-044
PM2.5	17	Thermo Scientific 2025i	RFPS-0498-118
Multi gas calibrator	4	TAPI T-700	N/A
Zero air system/generator	2	TAPI T-701	N/A
Continuous PM2.5 mass	6	Metone BAM 1020	N/A
Continuous PM2.5 mass	2	Metone BAM 1022	EQPM-1013-209
O3	12	TAPI T-703	N/A
Zero air system/generator	12	ADEM System	N/A
Multi gas calibrator	2	TAPI T-750U	N/A
Zero air system/generator	2	TAPI T-751	N/A

b.2 Instrument Needs

Please list your instrument needs in order of priority.

Will need continuous PM 2.5 monitors, ozone analyzers/ calibrators to replace obsolete 49C models, need to maintain replacement schedule of PM2.5 monitors.

c. Calibration

c.1 Calibration Frequency and Methods

Please indicate the frequency and method of multi-point calibrations of gaseous monitors.

Pollutant	Frequency	Calibration Method: Back of Instrument	Calibration Method: Through-the-Probe
SO2	annually	☐	☒
O3	annually	☒	☒

c.2 Calibration Questions

Please complete the following table.

Question	Yes	No	Comment
How are field calibration procedures documented, and how are the results recorded?			Captured by datalogger and recorded on calibration form.
Are calibrations performed according to the guidance in Volume II of the *QA Handbook*?	☒	☐	Click or tap here to enter text.
Are calibration procedures consistent with the operational requirements of Appendices to 40 CFR Part 50 or to analyzer operation/instruction manuals?	☒	☐	**If no, why not?** Click or tap here to enter text.
Have changes been made to calibration methods based on manufacturer's suggestions for a particular instrument?	☐	☒	**If yes, what change(s)?** Click or tap here to enter text.
Do standards used for calibrations meet the requirements of appendices to 40 CFR Part 50 (EPA reference methods) and Appendix A to 40 CFR Part 58 (traceability of materials to NIST, SRMs or CRMs)?	☒	☐	**Comment on deviations.** Click or tap here to enter text.
Are all flow-measurement devices NIST-traceable?	☒	☐	Click or tap here to enter text.

d. Certification

d.1 Flow Devices

Please list the authoritative standards used for each type of flow measurement, and indicate the certification frequency of standards to maintain field material/device credibility.

Flow Device	Serial Number	Primary Standard	Certification Frequency	Use (calibration, audit, or spare)
HiVol Orifice	10346	ADEM Rootsmeter	annually	Calibration
HiVol Orifice	19MX	ADEM Rootsmeter	annually	Audit
DeltaCal	694	Vendor	annually	Calibration
DeltaCal	863	Vendor	annually	Calibration
DeltaCal	864	Vendor	annually	Calibration
DeltaCal	1016	Vendor	annually	Calibration
DeltaCal	1017	Vendor	annually	Calibration
DeltaCal	1022	Vendor	annually	Calibration
Streamline	S-150104	Vendor	annually	Audit
Streamline	S-190201	Vendor	annually	Audit
Streamline	S130902	Vendor	annually	calibration
Streamline	S150103	Vendor	annually	calibration
Streamline	S-160404	Vendor	annually	calibration
Streamline	S-160405	Vendor	annually	calibration
Streamline	S-160406	Vendor	annually	calibration

d.2 Certification Questions

Please complete the following table.

Question	Yes	No	Comment
How are certifications performed? (internally, by a vendor, or third party?)			Internally, vendor and third party
Where do field operations personnel obtain gas standards?			Gas standards are ordered through the ADEM Lab
How are the gas standards verified after receipt?			Compared to previously calibrated analyzers.
What equipment is used to perform calibrations (e.g., dilution devices)?			Gas dilution system
Do the dilution air flow control and measurement devices conform to CFR requirements?	☒	☐	Click or tap here to enter text.
What traceability is used?			dryCal
Is calibration equipment maintained at each station?	☐	☒	Click or tap here to enter text.
How is the functional integrity of this equipment documented?			MFC calibration form
Who has responsibility for maintaining field calibration standards?			technicians

Please have copies of certifications of all standards currently in use from your master and/or satellite certification logbooks (i.e., chemical, gas, flow, and zero air standards) available for review during the on-site TSA.

Please attach an example of recent documentation of traceability.

d.3 Calibrator Certification

Please list the authoritative standards and frequency of each type of dilution, permeation and ozone calibrator, and indicate certification frequency.

Calibrator	Primary Standard	Frequency of Certification/Calibration
O3 Level 2 Standard	Region 4 SRP	annually
O3 Level 3 Standard	ADEM Level 2	Beginning and end of season

e. Repair

Complete the following table.

Question	Yes	No	Comment
Who is responsible for performing preventive maintenance?			Primarily Technicians, some basic tasks can be completed by Operators
Is special training provided to those personnel who perform preventive maintenance? Briefly comment on background or courses.	☒	☐	Vendor provided training. On the job, supervision by experienced technician or operator.
What is the preventive maintenance schedule for each type of field instrumentation? If this information is provided in agency SOPs, please indicate that in the Comment section.			Maintenance section of SOP and Operator's manual
If preventive maintenance is MINOR, it is performed at: (check one or more) ☒Field Station ☒Headquarters Facilities ☐Manufacturer			Click or tap here to enter text.
If preventive maintenance is MAJOR, it is performed at: (check one or more) ☐ Field Station ☒Headquarters Facilities ☒Manufacturer			Click or tap here to enter text.
Does the agency have service contracts or agreements in place with instrument manufacturers? Indicate in the Comment section or attach additional pages to show which instrumentation is covered.	☐	☒	Not allowed beyond initial warranty or service period.
Comment briefly on the adequacy and availability of the supply of spare parts, tools, and manuals available to the field operator to perform any necessary maintenance activities. Do you feel that this is adequate to prevent any significant data loss?	☐	☒	State no longer allows us to establish contracts with manufactures so every order must have multiple quotes; turnaround time is very slow and extra parts are very limited usually ordered as needed.
Is the agency currently experiencing any recurring problem with equipment or manufacturer(s)? If so, please identify the equipment or manufacturer, and comment on steps taken to remedy the problem.	☐	☒	Click or tap here to enter text.

f. Record Keeping

Complete the following table.

Question	Yes	No	Comment
What type of station logbooks are maintained at each monitoring station? (e.g., maintenance logs, calibration logs, personal logs, etc.)			Site, Analyzer, Calibrator
• If hard-bound logbooks are used, are they electronically scanned on any routine frequency? If yes, at what frequency?	☒	☐	All logbooks are scanned monthly and stored to the ESC folder on the LAN
What information is included in the station logbooks?			Personnel present, purpose of visit, activities conducted, time, maintenance
Who reviews and verifies the logbooks for adequacy of station performance? Does the reviewer initial or sign the logbooks to document the review?			Logbooks are reviewed by the QA Officer; She does not initial the logbook but her review is conducted every month and any issues documented in a database
How is control of logbooks maintained?			Logbooks are pre-printed with equipment serial numbers/property numbers or site name and year. Logbooks are replaced annually. QA Program coordinator is the only person to issue logbooks.
Where is the completed logbook archived?			All scans are securely stored on the ESC folder on the LAN; Hard copies are retained in AAU.
What other records are used? (Use drop-down menu below). Comment on the use and storage of these documents.			NA
Zero span record			Reported as part of MPKR
Are calibration records (or calibration constants) available to field operators?	☒	☐	The form is scanned and saved to the ESC folder on the LAN and a paper copy is attached to the calibrator.

****Please attach an example field calibration record sheet.***

5. Laboratory Operations

This section of the questionnaire completed by: Ronald L. Hamilton

Laboratory Name:

ADEM Field Operations Central Laboratory

Laboratory Address:

1350 Coliseum Boulevard, Montgomery, Al 36110-2059

Key Individual(s) (e.g., Laboratory Manager, Laboratory Supervisor, Laboratory QA Manager, etc.):

Title/Position	Name
Laboratory Manager	Ronald L. Hamilton
Laboratory QA Manager	Meg Sullivan
Chemist	Mishka Cole
Laboratory Supervisor	Rip Starr

a. Routine Operation

a.1 Methods

In the table below, identify which of the following analyses are performed in the laboratory, and state the method used to conduct the analyses.

Pollutant	Method
Pb	EQL-0380-044

Please describe areas where there have been difficulties meeting the regulatory requirements for any of the above methods.

None noted

a.2 Quality System

Complete the following table.

Question	Yes	No	Comment
Are procedures for the methods listed in Section a.1 included in the agency's QAPP and/or SOPs?	☒	☐	SOP 2414,4073
Have the laboratory SOPs been reviewed and approved by EPA?	☒	☐	Click or tap here to enter text.
Are SOPs easily and readily accessible for use and reference within the laboratory? If not, where are the documents stored?	☒	☐	ADEM Intranet
Does the lab have sufficient instrumentation to conduct the analyses?	☒	☐	Perkin Elmer Analyst 600 GFAA
Are separate facilities maintained for weighing the different sample types? (e.g., hi-volume vs low-volume), or is one weighing room utilized for all samples? Describe.	☐	☐	NA
Does your laboratory hold certifications? (EPA, NIST, State, NLAC, or other)	☒	☐	Certified to do lead in drinking water samples
Does your laboratory operate under a QA Manual or equivalent document?	☒	☐	Click or tap here to enter text.
Does your laboratory participate in PE programs?	☒	☐	Click or tap here to enter text.
Does your laboratory have a corrective action process for non-conforming work?	☒	☐	Click or tap here to enter text.
Does your laboratory have a laboratory staff person assigned the role of QA Officer?	☒	☐	Meg Sullivan is our QA officer

Please describe needs for laboratory instrumentation.

NA

b. Laboratory QC

b.1 Standards

Please identify the equipment and standards used in support of the gravimetric laboratory, including any quality assurance standards (such as additional weight sets or portable RH/temperature probes).

No gravimetric laboratory on-site

Device	Pollutant	Brand (Make)	Model (Class)	Calibration/Certification Expiration Date
Choose an item.	Choose an item.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap to enter a date.

Please have calibration/certification records for all laboratory standards available for review during the on-site TSA.

b.2 Laboratory Temperature and RH

Complete the following table.

Question	Yes	No	Comment
What is the accuracy specification and recording time (e.g., 5 min. averaging time) of the temperature sensor (logger) used in the gravimetric laboratory?			NA
What is the accuracy specification and recording time (e.g., 5 min. averaging time) of the relative humidity (RH) sensor (logger) used in the gravimetric laboratory?			NA
What is the accuracy specification for any RH/temperature audit device used in the laboratory, if applicable?			NA
Does the laboratory utilize an infrared (IR) gun to obtain sample shipment temperatures?	☐	☐	NA
• If yes, is the IR gun NIST-traceable? Provide the certification expiration date.	☐	☐	NA
• If no, what device is used to obtain shipment temperature? Please describe its traceability and provide a certification expiration date.			NA

c. Laboratory Preventive Maintenance

Complete the following table.

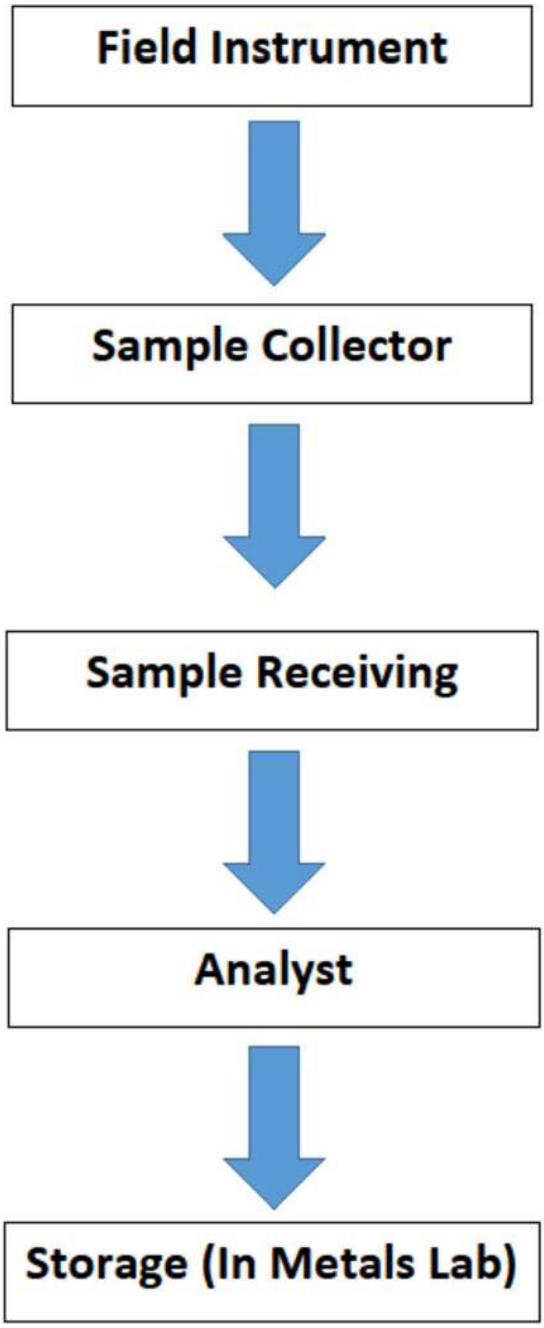
Question	Yes	No	Comment
For laboratory equipment, who has the responsibility for performing preventive maintenance?			Analyst and scheduled PMs from Perkin Elmer
If equipment maintenance is performed by laboratory staff, does a SOP detail the procedures to be followed? Provide the SOP title, date, and revision number where the procedures are found.	☐	☐	Digital logbook
Is a maintenance log maintained for the balance?	☐	☐	NA
Are service contracts in place for the balance?	☐	☐	NA
If utilizing a weighing room, are service contracts in place for the climate control unit/HVAC?	☐	☐	NA
Describe static control equipment utilized in the weighing room, if applicable.			NA
Does the weighing room undergo routine cleaning activities? On what frequency?	☐	☐	NA
Briefly describe the weighing room cleaning regime.			NA

d. Laboratory Record Keeping

Complete the following table.

Question	Yes	No	Comment
Are all samples that are received by the laboratory logged in?	☒	☐	The samples are logged into the LIMS,(LABORATORY INFORMATION MANAGEMENT SYSTEM)
Discuss sample routing (or reference the latest SOP which covers this). Attach a flow chart on the next page, if possible.			Sample collected in field, then brought into lab sample receiving where it is logged in. Labeled and presented to analyst/chemist for analysis. Stored in metals area. SOP 4901
For the following four questions, select the medium used to document various activities enlisted. If the medium is not listed, select "Other" and list the medium. If the information is not recorded, select "N/A".			
• Environmental conditions, weighing session results, balance checks, and weight checks?			NA
• Serial numbers of filters prepared for the field?			Hardcopy forms
• Serial numbers of filters returning from the field for analysis?			Hardcopy forms
• General information about daily lab activities, preventive maintenance procedures, and/or other significant events in the laboratory that may impact data quality or the data record?			Handwritten ledger logbook
How are data records from the laboratory archived?			Sop #8023 & ch 4.4.9 LOQAM
• Where are these records archived?			Sop #8023 & ch 4.4.9 LOQAM
• Who has this responsibility? (identify person/position)			Ultimate responsibility falls on lab manager.
How long are these records kept? Indicate the number of months/years.			Current records are kept 30yrs.
Does the laboratory SOP contain procedures for sample chain-of-custody (COC)?	☒	☐	Sop 4901 section 9.1.2
• If yes, indicate the title, date, and revision number, and where it can be found.			SOP 4901 Section 9.1.2,sample receiving and LIMS LOGIN.10-29-18 REV 5.2
What type of COC record accompanies the samples?			SOP 4901 SECTION 8.2
Does the laboratory maintain original COCs or copies?	☒	☐	The laboratory makes a copy and returns the original to sample submitter.
Where are COCs filed?			COC's are filled in sample receiving, scanned and then sent to filenet.

If possible, attach a sample routing flow chart:

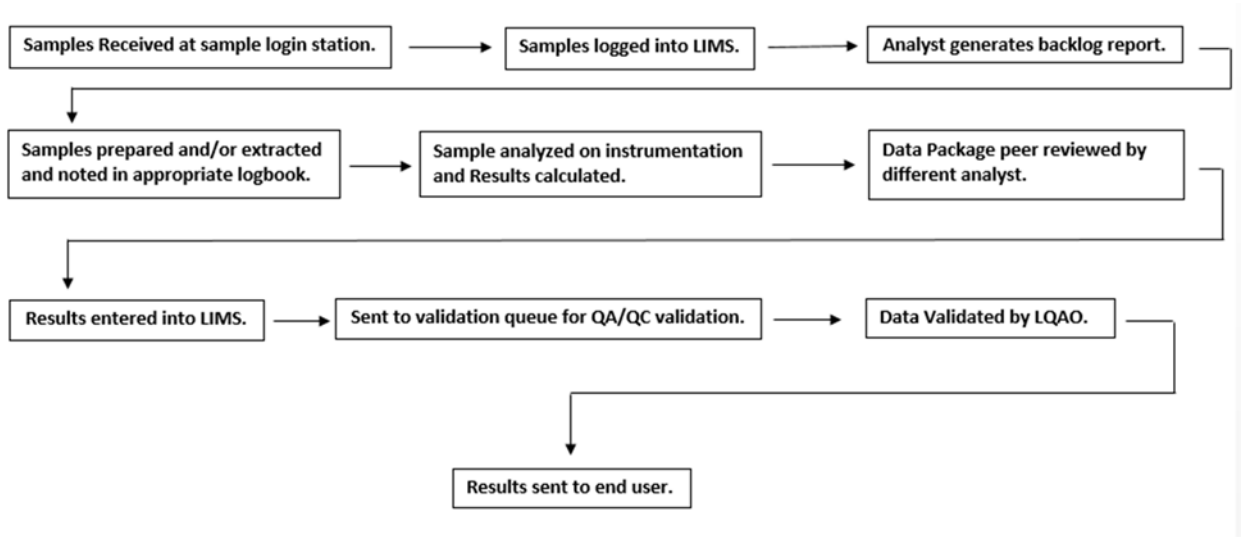


e. Laboratory Data Acquisition and Handling

Complete the following table.

Question	Yes	No	Comment
Identify those laboratory instruments (e.g., balances, temperature/RH loggers, etc.) which make use of computer interfaces directly to record data.			NA
Are QC data results readily available to the analyst during a weigh session?	☐	☐	NA
Do RH/temperature loggers record values using paper chart records (chart wheels)? If yes, where are the paper charts maintained? Are they signed and dated?	☐	☐	NA
What is the laboratory's capability with regards to data recovery? In case of problems, can the laboratory recapture data that may be lost in the event of computer failure? Discuss briefly.			Hard copy is maintained and is available for review.
Does the laboratory maintain an SOP that discusses how to use the laboratory's data acquisition instrumentation? If yes, please provide the SOP title, date, and revision number.	☐	☐	NA

Please attach a flow chart/diagram which illustrates the transcriptions, verifications, validations, and reporting processes the data goes through before being released by the laboratory.



f. Filter Questions

Complete the following table.

Question	Yes	No	Comment
Does the agency use filters supplied by EPA?	☒	☐	ADEM uses EPA to supply all filters
• If no, do the filters utilized meet the specifications in 40 CFR Part 50? Who is the vendor? Be prepared to provide documentation to demonstrate acceptance testing results.	☐	☐	NA
Are unexposed filters equilibrated in a controlled conditioning environment which meets or exceeds the requirements of 40 CFR Part 50? Describe the conditioning room/chamber.	☐	☐	NA
How long is the conditioning period?			NA
Briefly describe how exposed filters are prepared for conditioning.			NA
Briefly describe how and where exposed filters are stored after being weighed.			NA
On what frequency are lab blanks utilized?			NA
Are chemical analyses performed on filters? If yes, which? Where are these additional analyses performed?	☐	☐	NA

g. Metals & Other Analyses

If your laboratory completes lead (Pb) and/or other metals analyses, please complete the tables in this section.

g.1 Laboratory QA/QC

Question	Yes	No	Comment
Are at least one duplicate, one blank, and one standard or spike included with a given analytical batch?	☒	☐	Click or tap here to enter text.
Briefly describe the laboratory's use of data derived from blank analyses.			Blanks are used in mdl studies.
Are criteria established to determine whether blank data are acceptable?	☒	☐	Click or tap here to enter text.
How frequently and at what concentration ranges does the lab perform duplicate analyses? What constitutes an acceptable agreement?			Duplicates are run with every batch. Acceptable agreement is +/- 20%
Please describe how the lab uses data obtained from spiked samples, including the acceptance criteria (e.g., acceptable percent recovery).			The lab uses the recovery data to accept or reject, reanalyze or qualify the results.
Does the laboratory include samples of reference material within an analytical batch? If yes, indicate the frequency, level, and material used.	☒	☐	Audit strips included in every batch
Are mid-range standards included in analytical batches? If yes, describe the frequency, level, and compound.	☒	☐	At the beginning and end of every sequence and every ten samples.18ppb, 60 ppb. Pb
Are criteria for real-time QC established that are based on the results obtained for the mid-range standards discussed above? If yes, briefly discuss them below or indicate the document in which they can be found.	☒	☒	QC mid-range standards should be +/-10%
Are appropriate acceptance criteria for each type of analysis documented?	☒	☐	Click or tap here to enter text.

g.2 Chemicals

Question	Yes	No	Comment
Are all chemicals and solutions clearly marked with an indication of shelf life?	☒	☐	Expiration dates are noted on the bottles.
Are chemicals removed and properly disposed of when the shelf life expires?	☒	☐	Chemicals are placed in the hazardous storage room until pick up.
Does the laboratory purchase standard solutions, such as those for use with Pb or other metals analyses?	☒	☐	Various vendors are used certificates of analysis are filled
Are only ACS grade chemicals used by the laboratory?	☒	☐	Click or tap here to enter text.
Comment on the traceability of chemicals used in the preparation of calibration standards.			A unique number is assigned, recorded for each lot and documented in the logbooks.

g.3 Pb

Question	Response	Comments
Is Pb analysis performed by a contract laboratory? If yes, provide the laboratory name in the comment section.	No	Click or tap here to enter text.
What filter media is used for Pb analysis?	Glass fiber	Click or tap here to enter text.
Are filter samples visually inspected for defects (e.g., pinholes, tears and non-uniform deposit)?	Yes	Click or tap here to enter text.
Are filters invalidated if defects are found? If no, why not?	Yes	Filters are inspected prior to use and rejected if defects are found. Defects found during analysis are noted, use of data is determined by the end user.
Are tweezers used to handle filters? If yes, what material are the tweezers made of (e.g., Teflon, plastic, metal, etc.)?	No	Gloves are used to handle the filter
What extraction method is used for filters?	Ultrasonic bath	See ADEM Sop 4073
What reagents are used to clean glassware?		See ADEM SOP's 4073 & 4912.Lab detergent, DI WATER, 20% nitric acid
List standards used for analysis.		See ADEM SOP 4073,Stock lead solutions purchased from Perkin Elmer, SCP Science, Environmental Express or other
Are filter lot blanks analyzed for Pb content at a rate of 20 to 30 random filters per batch of 500 or greater? ***Only for filters not provided by EPA.***	N/A	All filters provided by EPA. Blanks analyzed every 20 filters.
How often are MDLs determined?		Yearly
How many replicates are used for MDLs?		Method Update Rule Initial seven then 8 or more replicates and blanks per year
Are MDLs calculated in accordance with 40 CFR Part 136, Appendix B? If not, why not?	Yes	Method update rule
Are waste HNO_3, HCL, and solutions containing these reagents and/or Pb placed in labeled bottles and delivered to a commercial firm that specializes in removal of hazardous waste?	Yes	Waste bottles are placed in the waste storage room and held for commercial pickup as needed.

6. Data & Data Management

This section of the questionnaire completed by: Gina Curvin and Mike Malaier

Key Individual(s):

Title/Position	Name
Mike Malaier	Program Manager
Gina Curvin	QA Coordinator
Samantha Connole Shawn LaGrone Carla Snow	Regional Section and Unit Chiefs
QA Officer	Pam Gross

a. Data Handling

Complete the following table.

Question	Yes	No	Comment
Is there a procedure, description, or a chart which shows a complete data sequence from point of acquisition to point of submission of data to EPA?	☒	☐	Click or tap here to enter text.
Are procedures for data handling (e.g., data reduction, review, etc.) documented? If yes, comment on where.	☒	☐	QAPP (B-10), SOP #2565, #2569, #2566
In what media (e.g., flash drive, telemetry, wireless, etc.) and formats do data arrive at the data processing location?			Excel spreadsheets, Flash drives and cell modems
How often are data received at the processing location from the field sites and laboratory?			Continuous data is retrieved hourly, particulate field data is retrieved at least monthly, and lab data is received after filters are analyzed, usually monthly.
Are there any activities being done before data is released to agency internal data processing?	☒	☐	Some auto-flagging is completed by the DAS; Operators review and invalidate data as appropriate according to SOP # 2565 or #2569
How are data entered into the computer system? (e.g., computerized transcription, manual entry, digitization of strip charts, or other)?			Lab Data are reported in Excel spreadsheets which are copied into data processing and validation spreadsheets with formatting built in to review specific control criteria. Continuous data flows directly into the AirVision Database which is reviewed and coded by the Operators. Verifications and audits are hand-entered into spreadsheets which is uploaded to AQS.

For manual data, is a double-key entry system used?	☒	☐	All hand-entered information is reviewed by an independent person (audits and verifications) or the data are entered into an independent spreadsheet and compared to original (Pb)

Please provide a data flow diagram indicating the data flow within the reporting organization.

b. Software Documentation

Complete the following table.

Question	Yes	No	Comment
Does your agency use an AQS Manual? If yes, list the title of the manual used including the version number and date published.	☒	☐	ADEM uses version available on the TNN web site. https://www.epa.gov/aqs/aqs-manuals-and-guides
Does your agency use an AirNow Manual? If yes, list the title of the manual used including the version number and date published.	☒	☐	ADEM uses documents on the Airnowtech Website. https://www.airnowtech.org/Resources.cfm
Does the agency have information on the reporting of precision and accuracy data available?	☒	☐	Click or tap here to enter text.
What software is used to prepare air monitoring data for release into the AQS and AirNow databases? Include the names of the software packages, vendor or author, revision numbers, and the revision dates of the software.			AirVision, Version 4.0.6 build 2018.12.03.2
What is the recovery capability in the event of a significant computer problem (i.e., how much time and data would be lost)?			A full backup is performed weekly on Friday evenings, differentials run every night, and logs every hour.
Has your agency tested the data processing software to ensure its performance of the intended function are consistent with the *QA Handbook Volume II, Section 14.0*?	☐	☒	NA
Does your agency document software tests? **If yes, provide the documentation.**	☐	☒	NA

c. Data Validation and Correction

Complete the following table.

Question	Yes	No	Comment
Is there documentation in regards to data that has been identified as suspect and subsequently flagged?	☒	☐	All issues and findings during data validation and review are documented in an internal access DB. All invalidated data are documented on MMDFs.
Please describe what action the data validator will take (e.g., flags, invalidate, etc.) if they find data with exceeded QC criteria.			They report issues to Operator for follow-up or correction. Or elevate the issue to the Program QA Coordinator and Program Manager. Data Validators do not directly modify any data.
Please describe how changes made to data that were submitted to AQS and AirNow are documented.			If caught during the OEQ DQA, all findings and the resulting corrections are documented in the internal access DB. Changes requested to AQS by the program manager for any reason including during data certification or due to corrective action are documented on the Post-validation MMDF. Typically no changes are made to Air Now data.
Who has signature authority for approving corrections?			**Name:** Mike Malaier **Program Function:** Program Manager
What criteria are used to determine a data point be deleted or invalidated?			QAPP Tables A-6 through A-11 list the critical criteria used to invalidate data.
What criteria are used to determine if data need to be reprocessed?			1. Completeness criteria, if a pollutant does not meet the completeness criteria for the quarter, the data is re-examined and may be reprocessed as a result. 2. Any other systematic or programmatic issues discovered during validation may also cause reprocessing of data.
Are corrected data resubmitted to the issuing group/record generator for cross-checking prior to release?	☒	☐	All validation corrections are completed by the record generator, then re-verified by the QA Officer prior to submittal to AQS. Then data are subject to the OEQ DQA after submission. Data corrections made to AQS during data certification review are reviewed by a second person for accuracy.

d. Data Processing

d.1 Reports

Complete the following table.

Question	Yes	No	Comment
Does the agency generate data summary reports?	☒	☐	Click or tap here to enter text.
Please list at least three reports routinely generated, including the information requested below.			
Report Title	**Distribution**		**Period Covered**
Monthly Data Validation Report	**Operator and Supervisor**		**Monthly**
Data Quality Audit	**Supervisory chain**		**Quarterly**
MPKR	**Supervisor and saved to LAN**		**Monthly**

d.2 Data Submission

Complete the following table.

Question	Yes	No	Comment
How often are data submitted to AQS?			Monthly or Quarterly
How often are data submitted to AirNow?			Hourly
Briefly comment on difficulties the agency may have encountered in coding and submitting data following the AQS guidelines.			Multiple codes for one purpose, no definitions on appropriate usage of codes; Sometimes no applicable code available.
Does the agency retain a hard copy printout or an electronic copy of submitted data from AQS?	☒	☐	AMP reports are printed quarterly and stored securely in the ESC folder on the LAN. This procedure only started with 4th quarter 2018. Prior to that, reports were generated as needed and for annual data certification.
Are records kept by the agency for at least three years in an orderly, accessible form? If yes, does this include:	☒	☐	Agency policy is to retain records for at least 6 years
• Raw data	☒	☐	In AirVision
• Calculations	☒	☐	In Excel spreadsheets
• QC data	☒	☐	All forms are stored on the ESC folder of the LAN
• Reports: list which reports are used	☐	☒	Click or tap here to enter text.
Has your agency submitted data (along with the appropriate calibration equations used) to the processing center?	☒	☐	If you mean AQS, all data submitted
Are concentrations of PM_{10} corrected to EPA standard temperature and pressure conditions (i.e., 298 K, 760 mm Hg) before input to AQS?	☒	☐	Click or tap here to enter text.
Are concentrations of $PM_{2.5}$ and Pb reported to AQS under actual (volumetric) conditions?	☒	☐	Click or tap here to enter text.
Are audits on data reduction procedures performed on a routine basis? If yes, at what frequency?	☐	☒	Click or tap here to enter text.
Are precision and accuracy data checked each time they are calculated, recorded, or transcribed to ensure that incorrect values are not submitted to EPA?	☒	☐	All hand-entered data is reviewed twice before submission

e. Internal Reporting

e.1 Reports

What internal reports are prepared and submitted as a result of the audits required under 40 CFR Part 58, Appendix A?

Report Title	Frequency
Instrument Performance Summary Report	After every audit
AMP 504 Extract QA Data	Quarterly

What internal reports are prepared and submitted as a result of the precision checks required under 40 CFR Part 58, Appendix A?

Report Title	Frequency
MPKR	Monthly
AMP 256 Data Quality Indicators	Quarterly

Question	Yes	No	Comment
Do either the audit or precision check reports indicated include a discussion of corrective actions initiated based on audit or precision check results?	☒	☐	The Instrument Performance Summary Reports include comments from the auditor and program manager plus corrective actions completed by the Operator. The MPKR includes what actions were taken to address the issue including any data invalidation.

e.2 Responsibilities

Who has the responsibility for the calculation and preparation of data summaries? To whom are such summaries delivered?

Name	Title	Type of Report	Recipient
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

Identify the individuals within the agency responsible for reviewing and releasing the data.

Name	Program Function
Mike Malaier	Program Manager

Question	Yes	No	Comment
Does your agency report to the Air Quality Index (AQI)?	☒	☐	Click or tap here to enter text.
Is data certification signed by a senior officer of your agency?	☒	☐	Click or tap here to enter text.